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ABSTRACT

The Greensboro Area Mathematics and Science Education Center and the Center for School Accountability and Staff Development sponsored a conference in May, 1998 which focused on the similarities and differences in teaching and learning in mathematics and science compared to learning in other content areas. This document contains the background papers from that conference. Chapters include: (1) "Foreign/Second Language Learning" (Janis L. Antonek); (2) "Teaching and Learning in Social Studies" (Ceola Ross Baber); (3) "Helping Students Learn Mathematics through Careful Sequencing of Problems and Questioning of Students' Thinking" (George W. Bright); (4) "Learning Technology and Other Things" (Christopher I. Cobitz); (5) "English Studies" (Brenda Cox); (6) "Incorporating Music in an Integrated Curriculum for Teacher Preparation" (Charlesetta M. Dawson); (7) "Learning To Do Science: Are Science Fairs the Key to Success?" (Catherine E. Matthews); (8) "Learning About--and From--Learning in the Social Studies" (Gerald Ponder); (9) "Development of an Elementary Social Studies Methods Course" (Tracy Rock); (10) "Integrative Instruction: Success and Frustration in Teaching against the Grain" (David Strahan); (11) "Teaching and Learning Mathematics" (Cecilia M. Toole); and (12) "Reading Instruction for Children in Elementary Schools" (Priscilla G. Wood). (ASK)

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CONNECTING LEARNING ACROSS DISCIPLINES:

Relationships between Learning in Mathematics and Science and Learning in Other Disciplines

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CONNECTING LEARNING ACROSS DISCIPLINES:

Relationships between Learning in Mathematics and Science and Learning in Other Disciplines

Edited by

George W. Bright

The University of North Carolina at Greensboro

July 1998

This book constitutes the proceedings of the conference, *CONNECTING LEARNING ACROSS DISCIPLINES: Relationships between Learning in Mathematics and Science and Learning in Other Disciplines*, held at The University of North Carolina at Greensboro (UNCG) on May 19, 1998. The conference was sponsored by the following agencies:

- Greensboro Area Mathematics and Science Education Center (GAMSEC)

  GAMSEC is one of the ten centers organized as the UNC Mathematics and Science Education Network (MSEN) in North Carolina. One of the main functions of the MSEN centers is delivery of professional development for mathematics and science teachers in grades K-12.

- Center for School Accountability and Staff Development

  This Center at UNCG is organized to study the effectiveness of professional development across all disciplines in order to improve instruction and produce greater student achievement.

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Learning and Teaching Across Disciplines: Summary and Synthesis of Conference Discussions

George W. Bright
The University of North Carolina at Greensboro

On May 19, 1998, the Greensboro Area Mathematics and Science Education Center and the Center for School Accountability and Staff Development sponsored a conference, *CONNECTING LEARNING ACROSS DISCIPLINES: Relationships between Learning in Mathematics and Science and Learning in Other Disciplines*, which focused on similarities and differences in learning and teaching in mathematics and science as compared to learning in other content areas. The conference was held on the campus of The University of North Carolina at Greensboro (UNCG). It was hoped that principles identified in the conference discussions would be useful in improving the quality of professional development in mathematics, science, and technology for all teachers, but especially for elementary school teachers.

Conference participants are listed in Figure 1, and the conference agenda is given in Figure 2. At the outset of the conference, the purpose was explained as a means of focusing the conversations on similarities and differences in learning and teaching across disciplines. Adjustments were made in the "focus questions" in the last half of the conference in order to take advantage of the substance of the conversations. Janis Antonek, George Bright, and Cecilia Toole attempted to capture the substance of the conversations with their note taking on laptop computers. These notes formed the input for creation of this chapter.

Figure 1. Conference Participants

Janis L. Antonek
Ceola Ross Baber
George W. Bright
Christopher I. Cobitz
Brenda Cox
Charlesetta M. Dawson
Catherine E. Matthews
Gerald Ponder
Tracy Rock
David Strahan
Cecilia M. Toole
Priscilla G. Wood

Figure 2. Conference Agenda

9:00	Introductions and Opening Remarks
9:15	Presentations I: Learning in Mathematics, Science, and Technology
	Toole: Mathematics
	Bright: Mathematics
	Matthews: Science
	Cobitz: Technology
10:05	Discussion I: Small Groups
	What common guiding principles emerge for learning in mathematics, science, and technology?
	What is important for teachers to know about learning in mathematics, science, and technology?
	How might we help teachers understand and use this information?
10:40	Reporting Back
11:00	Presentations II: Learning in Other Disciplines
	Baber: Social Studies
	Ponder: Social Studies
	Wood: Reading
	Cox: English
	Antonek: Language Acquisition
1:00	Presentations III: Learning Across Disciplines
	Rock: Interdisciplinary Studies: Science and Social Studies
	Dawson: Interdisciplinary Studies: Fine Arts
	Strahan: Interdisciplinary Studies
1:40	Discussion II: Small Groups
	What common guiding principles emerge for learning in other disciplines?
	What is important for teachers to know about learning in other disciplines?
	How might we help teachers understand and use this information?
2:00	Reporting Back
2:30	Summary Discussion: Whole Group
	What similarities and differences are there in guiding principles for learning in various disciplines?
	How can we communicate these similarities and differences to teachers?
	How might we expect teachers to make use of this knowledge?
	What messages should we send to professional development providers?
3:30	Future Efforts
	What types of future meetings should there be?
	What are the central issues that need to be addressed?
	Who should be involved?
	How might the issues be addressed?
	How do we help participants prepare for these meetings?
	What products might result from those meetings?
4:00	Adjourn

Each participant prepared a paper prior to the conference. These papers were duplicated and distributed during the conference, so participants did not have an opportunity to read the papers prior to the conference. Presentations during the conference were summaries and overviews of the papers. At the end of the day, participants were asked to read the prepared papers and then to revise their own work to include new insights revealed either by the conversations or by reading the papers. Final versions of all of the working papers are included in this volume.

Summary of Discussions

Given the diversity of approach and emphasis in the working papers, it is not surprising that the discussions ranged across many different issues. What was surprising to most of the participants, I think, was that even though we used different language to talk about these issues, we were in fact talking about many similar issues. Part of the difficulty in communicating across disciplines is that the subtlety of our language sometimes seems to focus on differences in emphasis while ignoring the similarities in concerns. It is easy to lose the sense of connectedness across disciplines when our language highlights the details (i.e., the trees) while ignoring the main issues (i.e., the forest).

Several general areas of discussion emerged: constructivism, defining content knowledge, teaching for understanding, and integrated curriculum. Each will be discussed in turn.

Constructivism

Constructivism seems to be a guiding principle of almost all current thinking about learning and teaching in all disciplines. In part this orientation seems to be a response to the perceived need to move away from teaching in traditional ways. To put it perhaps too simply, the goal of education is to generate greater student learning for many more kinds of students than have traditionally been expected to learn, so a new paradigm of teaching is needed. The paradigm that has attracted the most attention is constructivism, so most disciplines have moved to embrace that orientation. One difficulty which arises in cross-disciplinary dialogue about constructivism is that the various interpretations of constructivism are not identical, so the language that appears to represent common agreement may in fact mask fundamental differences. We may be talking past each other rather than with each other.

The following (somewhat exaggerated) ideas, which were "put on the table" during discussions as important aspects of constructivism, illustrate the difficulty of developing a common understanding of constructivism. Certainly, no one suggested that any one of these ideas is equivalent to constructivism, but the list reveals some of the "defining exemplars" that people use as simplified substitutes for the complex notion of constructivism.

- product versus process
- engagement of learners with content

- assimilation and accommodation (in a Piagetian sense of these words)
- scaffolding of learning
- building on what students already know

There is a long history of concern about whether product or process is the most important outcome of education. This dichotomy can be characterized as representing different goals of education. Constructivism, in contrast, addresses issues related to the way that students learn in addition to the outcomes of that learning. To the extent that people see discussion of constructivism only as a recycling of the historical debates, there will be a reluctance to acknowledge constructivism as a different paradigm.

One of the fundamental characteristics of a "constructivist classroom" seems to be the fact that students are deeply engaged with content. Yet, engagement by itself is clearly not sufficient for categorizing teaching as "constructivist." There appeared to be agreement that engagement with content really means intellectual engagement. Students may be intellectually engaged without necessarily being physically active. Evaluation of the effects of constructivist teaching may need to focus on how the learning and teaching will help students further their conceptual understanding of the content.

When students construct understanding, they change something that they already "knew;" this is similar to Piaget's notions of assimilation and accommodation. Yet, changing what we know may happen in non-constructivist ways, for example, by being told. For example, children may learn history through stories (e.g., stories told on special holidays). Because the knowledge generated in this way is incomplete and because children often do not have a clear sense of chronology, they may fill in the gaps of their knowledge with fanciful elaboration. It may be difficult for them to separate the "truth" from their individual elaboration. We must acknowledge all of the different ways that students can be supported in constructing knowledge.

Constructivism is also sometimes seemingly equated with "developmentally appropriate." Although these notions are not identical, there is probably considerable overlap. Conversations about the degree of overlap would seem to be useful.

Constructivism is not the same thing as "discovery" or even "guided discovery." There is an expectation that in constructivist classrooms, students have a great deal of support which assists them in their sense making. This support seems similar to scaffolding of learning, yet scaffolding in and of itself does not necessarily constitute constructivism. There was also a question raised about what content background students need as a base for being able to construct knowledge. What is the responsibility of teachers to "backfill" the knowledge of students so that they are able to construct meaningful knowledge? Can the backfilling, itself, be accomplished in a constructivist manner?

Constructivist teaching seems to require that teachers build on what students already know. This knowledge is certain to be incomplete and is often inaccurate. It would be a mistake for teachers to assume that students have no knowledge; it is more reasonable to acknowledge that the knowledge they have is incomplete or inaccurate. In order for teachers to understand the knowledge of their students, the teachers need frameworks for interpreting students' knowledge. In most disciplines, these frameworks are over-looked, if not unavailable. So is constructivism impossible? In social studies, for example, more energy seems to have been spent in trying to define the place of social studies in the total school curriculum rather than in understanding how the major ideas are learned. Recently, however, there appears to be a shift in research focus to try to understand how key ideas are acquired. In primary mathematics, there is a long history of research on how children solve mathematics problems, so there are frameworks that appear to be quite helpful to teachers in understanding the thinking of their students and in creating instruction that helps children move from less sophisticated thinking to more sophisticated thinking. In science there is a lot of information about students' misconceptions, but there appears to be much less research on how to use that knowledge about thinking in planning instruction. The emphasis on children's thinking reflects the notion that children do not necessarily think like adults. Yet, conservative critics of education often argue that one critical goal of education is to mold children's thinking to be more like adults' thinking. Adults may engage in more types of thinking processes than children; for example, decoding, analyzing, defining, clarifying, interpreting, comparing, evaluating, synthesizing, composing, and others. It is probably important to address the issue of how to help children develop all of these types of thinking.

Understanding the Content of a Discipline

Within each discipline, there are different kinds of knowledge that learners need to internalize: concepts, skills, procedures, facts, etc. In the literature, these differences may be cast as declarative versus procedural knowledge, knowing how and knowing about, process versus product, controlled versus automatic processing, and so on. For professional development of teachers there is a parallel dichotomy of teacher education versus teacher training, similar to discussions of training and education in the area of technology. During the conference discussions, it became clear that instruction should be balanced in its emphasis on the various kinds of knowledge that learners acquire.

The role of automaticity also surfaced repeatedly in discussion. The consensus was that any skills or procedures that become automatic should be built on a solid base of conceptual understanding. Even in the area of technology, where skill at using various software packages is valued, understanding of the conceptual underpinnings of functionality (e.g., cut and paste) seems to assist users in transferring their skill from familiar to unfamiliar programs. If learners are not challenged, for example, by being asked to demonstrate their skill in unfamiliar settings, automaticity may get in the way of learning concepts. Learners may be "process bound" by the particular keystroke sequences of a particular program. In other disciplines as well, evidence of learning is often in the doing of new things rather than in the repeating of familiar things. Learners need to understand the skills and concepts that carry over from one activity to another.

During the discussions, the image of "science fairs" emerged as an image to represent both the promise and the pitfall of "doing science." On the one hand, science fair projects can provide a context within which a student can apply many different processes as they pertain to examination of concepts. Yet, teachers can also assume that the creating of the project is adequate science instruction so that they do not have to organize any other kind of instruction. Teachers who might be uncomfortable teaching science might turn to science fair projects as a substitute for planning instruction themselves. Interestingly, several conference participants felt that the practice of hiring specialists to take over certain kinds of instruction (e.g., fine arts, science) in a school may have the adverse effect of relieving teachers of the responsibility for planning such instruction themselves. If a student knows and can do science, then a science fair project becomes an opportunity to demonstrate that knowledge. If a student knows little science, then the project may evolve into activity for its own sake.

It might be useful to have other "powerful images" that can help concretize abstract notions, such as what constitutes effective instruction. For example, use of an "evaluation rubric" as the primary vehicle for writing instruction may focus students' writing too narrowly, and the "accelerated reader program" seems to encourage behaviors (e.g., sharing answers for comprehension tests) that are counter-productive to developing reading skills. To the extent that these models of instruction are well known to teachers, they provide vivid examples of approaches with clearly identifiable flaws.

Toward the end of the day, a question arose about how to define the content within each discipline. For example, in science there is a clear difference between knowing science and doing science, and in foreign language education there is a clear distinction between acquisition of a foreign language and learning of a foreign language. It quickly became clear that in talking about any particular discipline, we struggle to find adequate language to communicate to those outside the field what the nature of our content is. We even struggle with knowing what is a "discipline" (e.g., mathematics) and what is a "field of study" (e.g., social studies). Some areas of interest (e.g., reading) may not be either a discipline or a field of study. Further, we struggle with knowing how much children's learning should "look like" the work of professionals in a field. But we all seemed to agree that teachers need to know and participate in the work of a discipline so that they have an image of what students might need to do

Content areas seem to have different "content maps." For example, in social studies, the content map seems relatively flat, with few differences among different sub-disciplines (e.g., anthropology, political science) in their relative importance. In mathematics, in contrast, there may be important differences in the importance of relative ideas (e.g., "function" is a critical concept).

An issue that arose repeatedly in the discussions was "efficiency" of knowledge. All disciplines have procedures that are important for engaging with the content. Often, these procedures have developed over centuries to help professionals deal with content. When is efficiency important in a discipline? There appear to be tensions between efficiency as an abstract construct and efficiency for an individual learner. At the individual level, learners have different amounts of expertise, so what may be efficient for one person may not be efficient for another person. Individuals may become efficient in different ways and for different purposes.

For any teacher, learning (both content learning and pedagogy learning) may be heavily influenced by critical episodes. From our discussions, it was not clear how we might think about the role of episodes in facilitating learning. However, one external factor that we did agree was important for shaping teachers' views of content in a discipline is external testing (e.g., state-mandated tests). In our discussions, we seemed generally to agree that there is a negative impact on teaching and learning when teachers assume that what is tested by formal standardized instruments is the only important content of a discipline. There is a need for both teachers and the community at large to understand that tests can only sample a small part of a discipline and that teachers are responsible for teaching all of the content of a discipline, not merely what is tested.

Teaching for Understanding

In each discipline, the role of the teacher seems to be shifting away from being a conveyer of information and toward being a guide for helping students construct personal meaning. Providing scaffolding for learners is an important part of this new teaching, but the characteristics of effective scaffolding do not appear to be clearly understood. Scaffolding should help learners internalize concepts and skills rather than help learners learn only to replicate procedures that teachers demonstrate. There are few guidelines either for knowing when teachers should tell something to learners or for helping teachers structure content so that students are more likely to construct critical content knowledge. Questioning may be one tool that teachers can use effectively to help focus learners' attention on important content, though it appears that in current practice, questioning is used infrequently. Novices (e.g., students), after all, frequently assume that all parts of a body of knowledge are equally important, whereas experts can identify which parts are most critical and which parts can be afforded less attention.

It is not clear whether we know what teachers need to know in order to be effective at providing appropriate scaffolding, and it is quite clear that we know little about how to help teachers acquire that important knowledge. We all seemed to agree, however, that teachers need solid content knowledge themselves if they are to be successful. For teacher educators, this issue raises the concern of how we apply constructivism to the task of helping teachers acquire this content knowledge.

The use of multiple teaching strategies, based for example on learning styles, is one way that teachers have attempted to help more students learn. It was not clear, however, whether the purpose of doing this is because each student might connect better with one of these strategies than with others or whether every learner needs to experience and be successful with content tasks in a variety of settings.

When there are common characteristics for content in more than one discipline, the teaching of those disciplines ought to share important characteristics. For example, science and literature share some structural characteristics, namely, use of both inductive and deductive reasoning. The teaching of science and literature, then, ought to share some similarities. Similarly, writing and reading are both "big processes" that might share some structural characteristics that might also be shared by science, mathematics, or social studies. The teaching of these disciplines ought to have some common features, but there is little literature that explicates these similarities.

Writing to learn content is becoming increasingly common, particularly through journaling and reflective questioning. For example, writing is useful to respond to questions and to record information. In language acquisition literature, there is a recognition that listening evokes semantic processing of information, so that the meaning of the communication can be understood, while speaking evokes syntactic processing of information, so that the meaning intended by the speaker can be understood clearly by the listener. One might expect that similar concerns would apply to written work. How is writing as part of the learning of content influenced by students' syntactic abilities? What other forms of representation (e.g., diagrams) affect what is learned by journaling? How is generalizing influenced by the use of writing at various points in the learning process? Can writing be done too early in the learning process? Is it better to wait until students have internalized key ideas about the content?

Of course, the use of writing to learn content assumes that students know how to write. Learning to write is involves very complex cognitive processes. Teachers who want to integrate "writing to learn" in their pedagogy will need to understand the complexities of "learning to write." As teachers assess what students' writing reveals about their understanding of content, they will need to determine whether students' difficulties with writing itself are influencing what they are communicating about the content.

We can also think of anything in written form as being literature, this means that we are helping students create a literature of student thinking. How might that literature be studied by teachers to understand students' thinking or by students themselves to understand their own thinking?

The learning of content across disciplines had a parallel in the learning of pedagogy across methods courses. We know virtually nothing about how the learning of how to teach one discipline interacts with the learning of how to teach other content. Currently there is a lot of rhetoric about helping teachers use "best practices" for teaching. Our discussions indicated that best practices might be too content-specific; rather some notion of "guiding principles" for teaching might be a better way to conceptualize what is common across the teaching of all content. Teachers' beliefs clearly influence the ways that teachers teach, and it may be more important to help teachers understand their beliefs rather than providing them with a "bag of tricks" that may not be consistent with a teacher's particular philosophical orientations. For example, especially at the secondary level, there may be a personal pride in the fact that "I know my content." This pride may actually interfere with a teacher's ability to be flexible in dealing with students who are much less knowledgeable or confident in their knowledge.

Learning across Disciplines versus Integrated Curriculum

Understanding how learning and teaching are similar across disciplines is quite different than creating integrated curriculum, though this understanding may help make integrated curriculum more effective. There are three major areas of tension for interdisciplinary teaching: philosophical, practical, and political. Personal and professional philosophies may not be consistent, and beliefs about the value of interdisciplinary teaching may inhibit whether such teaching ever occurs. Practical tensions include having time to plan and how teachers respond to external pressures, such as external testing. Political tensions include generating support for interdisciplinary teaching and enculturating new teachers into interdisciplinary practices.

Our discussions suggest that there are a variety of cognitive processes that are similar across disciplines. These include decoding, defining, analyzing, interpreting, comparing, evaluating, synthesizing, problem solving, reflecting, and so on. In order to take advantage of these common processes, however, teachers need to have knowledge of students' prior experience and expertise with them. Students always have incomplete understanding of content, but they may also have incomplete understanding of and expertise in the processes needed to learn content. Helping teachers learn how to develop the understanding of students is a critical step in improving the effectiveness of learning across content.

Synthesis and Recommendations

As is clear from the summary of the discussion, there are many general comments that can be made to provide synthesis for our thinking. Some of these flow directly from the conversations, while others represent reflections on our discussions rather than points made during the discussions themselves. The comments are organized under four headings: content, teaching, roles, and teacher development.

Content

- There are common categories of content (e.g., concepts, skills) for all disciplines, though the precise definitions of these terms may be different from one discipline to the next.
- Knowing content and engaging in the processes of making knowledge, though different, are both important in any discipline.
- Within each discipline, there are important patterns (e.g., generalizations) that learners need to recognize explicitly.
- Learners should expect to find patterns that will help them organize knowledge within each discipline.

There are common tensions within disciplines, for example, concept versus skills, process versus product. Teachers and learners have historically struggled with knowing how to balance these tensions. But a different perspective that emerged from the conference is that understanding the content of any discipline means, in part, understanding the patterns within the knowledge of that discipline. Learning these patterns is one critical part of developing understanding of a discipline. If learners are to see those patterns, they (and their teachers!) must first believe that patterns exist. Indeed, if learners are not seeking patterns, they may resort to rote learning as the primary technique for acquiring knowledge. Developing the expectation for finding patterns may be one of the most important parts of teaching content.

Teaching

- Intellectually engaging instruction is important in all disciplines.
- Balance in teaching different kinds of content is important, and varied instructional strategies seem important for helping students learn content.
- Prior knowledge of learners matters. Instruction should build on what students know.
- Integration is a natural process for learners, so helping them see the commonalties in learning different disciplines ought to benefit students.
- There are common cognitive processes and modes of inquiry that support learning across all disciplines.

Because there are commonalties in the structure of content across disciplines, it is not surprising that there should be commonalties in the teaching of content across disciplines. What this conference highlighted, however, is the notion that there are many common processes for learning content that are perhaps rarely made explicit for learners. Doing so might improve the odds that learners will transfer what they learn across disciplines.

Roles

- The "new roles" for teachers expected by professionals within each discipline seem to be converging around common themes.
- The "new roles" for students expected by professionals within each discipline seem to be converging around common themes.

In every discipline represented at the conference, teachers are expected to move away from conveying information to facilitating students' construction of knowledge. Too, students are expected to assume more responsibility for creating personal, deep knowledge of content. Both shifts require that classroom discourse become more sophisticated. Both teachers and students need to enter into conversations around significant questions so that meaning can be negotiated and refined. In order to do this, teachers may need greater skill at posing questions that spark reflection by students.

Teacher Development

- Understanding distinctions between (a) learning across disciplines and (b) curriculum integration may be important for teachers and teacher educators.
- Connecting learning across disciplines requires (a) dialogue among teachers, teacher educators, and researchers and (b) time to explore relationships among fields of study.

The conference discussions were only a first step in understanding how learning mathematics and science is related to learning in other disciplines. Much more conversation and reflection is needed. Teachers, teacher educators, and researchers all need to be involved in those conversations.

Next Steps

We hope that our conversation is only the beginning of many more conversations about the similarities and differences in learning across disciplines. As professional development providers for both preservice and inservice teachers, we need to address directly the ways that learning one kind of content has payoff for learning other content. We will have to work together across disciplines to reach consensus on these important and difficult issues. One first step would be to begin thinking about the patterns that are most critical for each discipline. How can we communicate these patterns to others so that we can see the relationships among the patterns?

We encourage existing "institutions" (e.g., UNCG Teachers Academy, University/School Teacher Education Partnerships at UNCG and NC A&T, Mathematics and Science Education Network) to find ways to support additional conversations about learning across disciplines. Inservice teachers, university content faculty, and others need to be brought into these conversations. We hope that this volume will act as a catalyst for the planning of such conversations.

Foreign/Second Language Learning

Janis L. Antonek
The University of North Carolina at Greensboro

Research in the study of language acquisition is at the crossroads of many disciplines (e.g., linguistics, sociolinguistics, psycholinguistics, neuroscience, speech pathology, cognitive psychology, philosophy, and anthropology). In the absence of pathology, most people become fluent in their first language; however, learning a second language is less uniformly successful (Wong-Fillmore, 1991). Contrary to the pervasive monolingualism in the United States, more people in the world are bilingual than monolingual. While it is common for people to learn more than one language, how second languages are acquired is not agreed upon in the research. Factors contributing to learning another language and widely researched in the literature are: the learning context, instructional variables, and learner variables.

Tucker (1998) says that over the past several decades, knowledge of factors affecting language learning has been fragmentary, but a more coherent picture of how children learn languages is emerging. He attributes the enhanced picture of how children learn language to the trend for foreign language researchers to use both qualitative and quantitative research techniques.

The Nature of Language

Language is a complex array of phonology, syntax, morphology, semantics, and pragmatics: form, content, and usage. Through words, sentences, and discursive interaction we construct and share thoughts. Language is a valuable tool for communicating, for understanding the human mind, and for facilitating learning. Language is a window into cognition.

Since no unitary theory of language acquisition exists, how research is conducted in the discipline and what constitutes evidence depends on theoretical orientation. For example, from a nativist perspective, language knowledge is innate. Chomsky refers to a language acquisition device that the brain is equipped with that enables language to emerge in a child. Within the nativist paradigm, researchers search for features common to all languages (e.g., existence of nouns and verbs, a system of negation). The empiricist, behaviorist, Skinnerian perspective asserts that the mind is a blank slate and that language is learned through stimulus-response. A social interactionist/constructivist perspectives holds that children learn language through interaction with others, relying on multiple cognitive abilities (Rymer, 1993). From a social-interactionist perspective the ideal way to learn a second language is through interacting with teachers, caregivers, friends, and others and engaging in authentic activities and meaningful discourse (e.g., telling stories, fighting over a toy, deciding who gets the biggest piece of cake, responding to commands). The extent to which language learning is a solitary or social activity, predetermined or constructed through interaction with others, is argued in the literature.

The Second/Foreign Language Distinction

In order to appreciate more fully the language acquisition research it is helpful to understand that the terms second and foreign language are distinguished in the literature. The distinction is important because the context affects teaching and learning in many ways (e.g., methodology, practice opportunities, access to teaching materials, and learner motivation). Second language learning traditionally refers to a context in which the language being learned is the language of wider communication (e.g., a Russian studying English in the United States). Foreign language is a term used to indicate a context in which a learner who is studying a language that is exogenous to the community (e.g., an American learning Russian in the United States). Most American students learning another language are learning a foreign language.

The Acquisition/Learning Distinction

Learning and acquisition are also different. Krashen (1985), in his acquisition-learning hypothesis, asserts that acquired and learned knowledge evoke different cognitive processes. "Acquisition is a subconscious process identical in all important ways to the process utilized by children in acquiring their first language," (p. 1) whereas "learning refers to 'explicit' knowledge of rules, being aware of them and being able to talk about them" (Krashen & Terrell, 1983, p. 26). According to Krashen, learning and acquisition involve two fundamentally different and separate processes in the mind. Learning, usually associated with academic settings, is conscious knowledge. Acquisition, usually associated with naturalistic settings, is subconscious knowledge. Speakers who have acquired a second language echo this sentiment when they say, "I don't know why we say it like this in Italian, we just do." Conversely, unsuccessful foreign language learners lament, "I can't speak a word of Spanish but I can conjugate verbs and I know the rules for using the subjunctive." Extending the notion of the acquisition-learning distinction, Krashen asserts in his monitor hypothesis that learned language will be of use only in a context where learners have time to monitor their language (e.g., an untimed writing activity). Acquired language, however, equips the learner to participate in everyday conversations, when the real-time nature of the discourse does not accommodate time-intensive, form-focused editing. The extent to which students are learning or acquiring a language in the classroom is influenced by teaching methodology. If a methodology continuum were to be drawn, at one end would be methods that rely exclusively on "learning" techniques (e.g., grammar translation) and at the other, communicative methods that rely exclusively on techniques that accommodate "acquiring" a language (e.g., the natural approach). The current trend is for foreign and second language classrooms to be communicative.

Input, Output, and Interaction

According to Krashen (1985), we learn language through receiving input that is comprehensible and just beyond our present competency level; a construct he has termed *i*+1 (input plus one). Swain (1985), in her output hypothesis, argues that comprehensible input is important but not sufficient for language acquisition. Swain's research led her to conclude that students need opportunities to produce language. According to Swain, linguistic output serves three functions: (a) to push students to find alternate ways to express themselves during a communication breakdown, (b) to evoke syntactic processing (focusing on structural features of language) as opposed to relying heavily on semantic processing (focusing on the meaning of words, and (c) to provide the learner with opportunities to test hypotheses about the second language. Long (1981) argues that learners need opportunities for interaction. According to Long (1983), speakers modify their language as they "negotiate meaning" through interaction with each other. Social-interactionists, working from a Vygotskian perspective, take interaction a step beyond Long's notion by emphasizing the importance of the social nature of language and assert that language learning takes place through interaction with more capable others (e.g., caregivers, teachers, and peers) and is influenced by the context in which one is learning a language.

Comprehension is the process of understanding input. Language production is the ability to generate output. In beginning language learning, ability to comprehend a language generally precedes and surpasses the ability to produce a language. Krashen emphasizes that teachers should respect a 'silent period' and not push students to produce language before they are ready. Tucker, Donato, and Antonek (1996) found that parents may underrate their children's foreign language learning because of unrealistic expectations for language production.

Age in Language Acquisition

Individual variables (e.g., age, aptitude, social-psychological factors [motivation, attitude], personality, cognitive style, hemisphere specialization, and learning strategies) and their role in language acquisition are of great interest to scholars. The role of age in language learning is one of particular interest to and widely debated by language acquisition researchers. Since Lennenberg (1967) first raised the issue of age-related constraints to learning a language -- a critical or sensitive period (Lamandella, 1977) -- evidence indicates that a learner's ultimate attainment in a language is affected by the age at which language learning begins. With recent scientific advances research on the brain (cf., "Your Child's Brain" Newsweek, 1996), science provides converging evidence that to learn a second language successfully, study should begin before age ten. Research carried out at Memorial Sloan-Kettering Cancer Center shows that, as we age, language is processed differently and stored in different parts of the brain, hindering native-like acquisition, particularly in phonology (how you sound) and syntax (how you construct sentences).

Another way that age plays a key role in language acquisition is that younger learners are more likely to receive developmentally appropriate input. Foreign language classes in the elementary school are the perfect venue for learning content objectives (e.g., concepts like adding single digit numbers, sinking and floating, and classification along one dimension). Much learning in the early years involves visual reinforcement of concepts with manipulatives, hands-on tasks, and learning by doing. In contrast, for older beginning learners of a foreign language, cognitive ability surpasses language proficiency, and objectives in their course work are less easy to represent visually (e.g., understanding principles of democracy).

Language Proficiency

The issue of language proficiency (how well one has attained a foreign or second language) is central to the resolution of many educational issues (Cummins, 1994). What does it mean to speak a language proficiently? How does one know when one is fluent?

To assess oral language proficiency, the American Council on the Teaching of Foreign Languages (ACTFL) has developed an oral proficiency interview (OPI) and a rating scale with the following descriptors: novice, intermediate, advanced, and superior. While these descriptors accommodate a common discourse among language specialists, enabling us to discuss learner proficiency levels, they do not capture the complexity of the proficiency issue. For example, someone may have attained an advanced ability to speak a foreign language on a given topic within one area of expertise but not in another. Proficiency and cognitive development may be on an equal footing in one language but not in another.

Cummins (1984) and other researchers (e.g., Bruner, 1975; Donaldson, 1978; Olson, 1977), have demonstrated a fundamental distinction between contextualized and decontextualized language proficiency. This distinction is important in understanding language and literacy development in children. As Cummins describes, academic language is more likely to be decontextualized than the context-embedded language of everyday communication. Therefore, a child's conversational, basic interpersonal communication skills (BICS) may outstrip his cognitive academic language proficiency (CALP), adversely affecting his participation in cognitively demanding academic tasks (Cummins, 1984).

Cummins (1994) asserts a relationship between cognitive maturity and first-language literacy with the development of proficiency in academic language in the second language. He also asserts that personality variables (e.g., willingness to actively engage in conversation with native speakers) may better relate to success in developing conversational proficiency in another language. We cannot assume that students have the CALP to access the core curriculum just because their BICS are strong.

Following the qualitative/quantitative research trend, Donato, Antonek, and Tucker (1996) found that children's foreign language proficiency grew differentially. Their research suggests that given a complex set of variables (e.g., attitude, parental involvement, and age of beginning instruction) students learn a second language at different rates and show individual patterns of mastering language sub-skills (e.g., comprehension, fluency, pronunciation, vocabulary, and grammar) in spite of having the same foreign language teacher and the same amount of time on task.

Assessment

In many cases, issues of how learning is assessed are the same as those discussed in other disciplines. For example, foreign/second language assessment may be standardized or dynamic and authentic; process or product oriented; holistic, global or discrete point; or formative or summative. As in other disciplines, the purpose of the assessment is the driving force behind the choice of type of assessment. Additionally, what one values in language learning also affects the choice, and language learning may be assessed by integrated or isolated skill area (e.g., listening, reading, speaking, and writing).

The different assessment options for oral language proficiency can be seen in the Student Oral Language Observation Matrix (SOLOM), which evaluates comprehension, fluency, vocabulary, grammar, and pronunciation) and the ACTFL Oral Proficiency Interview (OPI), which is a global rating of overall fluency. At the same time, learners may be evaluated for grammatical accuracy and memorization of words and language facts.

In line with national Standards for Foreign Language Learning (1996), learners may be evaluated for their ability to communicate and interact effectively in the foreign/second language, their understanding of other cultures, their ability to acquire information from other content areas (e.g., mathematics and science), their insight into the nature of language and culture, and their ability to participate in multilingual communities at home and around the world. Communication, as opposed to grammatical knowledge, is the organizing principle for foreign language study as outlined by the national Standards.

Conclusion

In reflecting on the ideas in this paper, I am reminded that language learning is both complex and multi-faceted, and it is a lifelong process. As evidenced by national standards, foreign/second language educators believe that, while we may need to work on parts of language (e.g., grammar and vocabulary), language is whole and has evolved for the purpose of communicating and interacting with others. Language is learned for immediate as opposed to future use (e.g., accessing the core curriculum, sending an e-mail message, reading an authentic text, talking to a friend).

The human mind accommodates learning multiple languages, albeit with differential success. Recent scientific discoveries and improved research techniques provide promising new tools for uncovering findings related to language acquisition. National standards provide guidelines for the profession. This paper has served to share the issues and complexity of language learning with social scientists in other disciplines. Hopefully, the dialogue begun with this conference will continue so that a clearer picture will emerge regarding how learning takes place across disciplines.

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Teaching and Learning in Social Studies

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What is worth learning is one of the perennial questions in all curriculum and instruction endeavors. Social studies educators have struggled with this question since the 1916 Committee for the Social Studies and have bounced back and forth between narrowly defined academic and socialization outcomes until the 1960s. The "New Social Studies," grounded in Bruner's (1960) structure of the disciplines, emphasized reflective inquiry within discrete disciplines. By 1970, however, interdisciplinary materials were being developed; that is, the interrelationship between history and the social sciences was recognized, and instructional materials were designed which integrated concepts and generalizations from a variety of disciplines.

The end of the 1960s and beginning of the 1970s also saw an emphasis on values education in the social studies. By the late 1970s the educational reform in the United States was consumed by the "back to basics" movement which for social studies education, meant a return to teaching and learning low-level facts, a strict nationalistic definition of citizenship, and little civic action.

The 1990s focused on creating a vision of powerful teaching and learning in the social studies to demonstrate "that the field can navigate between both the formless, content-starved 'mini courses' that punctuated the 60s and 70s and the arid parade of names, dates, and places that marked traditional courses in the preceding decades" (O'Neil, 1989, p. 1). Powerful social studies teaching and learning erases the false dichotomies between content and skills, between thinking and feeling, and between academic knowledge and experiential knowledge; in other words, all the dimensions of a student's learning should be integrated.

The National Council of Social Studies (NCSS, 1993) vision of powerful teaching and learning in the social studies laid the foundation for the curriculum and instruction (i.e., professional) standards that are carrying the field of study into the twenty-first century. This paper uses the 1993 "Vision of Powerful Teaching and Learning in the Social Studies," the 1994 "Curriculum Standards for Social Studies," and the 1997 draft "Standards for Social Studies Teachers" as resources in the examination of the following the key questions:

- What is worth teaching and learning in social studies?
- How can students acquire particular social studies content and transfer this learning across disciplines and school subjects?
- How can social studies learning be assessed?

Additional resources include the *North Carolina Teacher Handbook for K-12 Social Studies*, research literature, and "best practices" literature.

What's Worth Teaching and Learning in Social Studies?

The aim of social studies is the promotion of civic competency which is achieved through teaching and learning activities in four major goal categories: knowledge, skills, attitudes, and civic action. The knowledge category is grounded in the core and related disciplines that comprise the content of social studies. "Social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences" (NCSS, 1994, p. 3).

Facilitating students' formation of key concepts from these disciplines and fields of study is a primary responsibility of the social studies teacher. Concept formation involves three levels of knowledge construction: facts, concepts, and generalizations. Unfortunately, too many social studies teachers only use a fact-based approach; that is, they use facts as the end rather than as a means to an end. Or, they just transmit to students concrete concepts (e.g., names, places, dates) rather than facilitate the students' understanding of abstract concepts (e.g., democracy, freedom) that can then be used to build and analyze generalizations. In other words, many social studies teachers rely too much on procedural as opposed to conceptual knowledge and teach only in the transmission mode.

Skill development is an important part of social studies. Both the national standards and state guidelines emphasize that four broad skill should be taught through the application of knowledge. These skills are (a) acquisition of information from a variety of sources, (b) use of information in problem solving, decision making, planning, and construction of new knowledge, (c) constructive group participation and interpersonal relationships, and (d) effective civic participation (Public Schools of North Carolina, 1997, pp. 20-23).

The affective domain is very important in social studies teaching and learning. This domain is manifested through teaching and learning that facilitates the clarification of attitudes, values, and beliefs. The democratic beliefs and values outlined in our nation's founding documents as rights, freedoms, and responsibilities serve as the basic elements of this goal category in social studies. In addition, social studies teaching and learning helps students construct personal, academic, pluralist, and global perspectives as they "develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world" (NCSS, 1994, p. 3).

How Can Students Acquire Particular Social Studies Content and Transfer This Learning Across Disciplines and School Subjects?

The NCSS (1992) vision emphasizes that social studies teaching and learning is powerful when it is meaningful, integrative, value-based, challenging, and active. These five critical features are reiterated in the curriculum standards (NCSS, 1994) as well as the proposed standards for teachers (NCSS, 1997). *Expectations of Excellence: Curriculum Standards for Social Studies* describe what PreK-12 learners should know and be able to do relative to a set of ten thematically-based standards with performance expectations. The standards for teachers specify what social studies teachers should know and be able to do in order to ensure that their students meet performance expectations. Figure 1 outlines learner and teacher expectations for each of the ten themes as well as classroom-based applications for the elementary and middle grades.

Content integration (i.e., integration of knowledge, skills, and attitudes within and across the social studies disciplines and other subject areas; as well as integration of basic literacy and mathematics skills), cooperative learning, and interactive learning are mentioned in the curriculum standards, teacher standards, research literature, and "best practices" literature as effective strategies for helping students acquire specific social studies content and transfer this learning across disciplines and school subjects. Teachers need to help students (a) connect the past to their present and future, (b) recognize that there are multiple historical, geographical, and cultural perspectives, thus expanding their world views and strengthening their global citizenship, and (c) work together to analyze social problems and design proactive solutions. Teachers need to provide students with opportunities to (a) read for literal and inferential understanding, (b) appreciate the performing and visual arts as well as literature, (c) communicate in the oral and written traditions, (d) apply the scientific method in solving social problems, and (e) explore the ethical dimensions of social issues (cf., Allen & Stevens, 1998; Dana, 1993; Ellis, 1995; Ferguson, 1990; Grant, 1996; Irwin, Lunstrum, Lynch-Brown, & Shepard, 1995; Maurer, 1994; NCSS, 1992, 1994, 1997; Scharmann, 1990; Selwyn, 1995; Skeel, 1995.)

Figure 1. Expectations and applications related to the NCSS curriculum standards

BASIC TEACHER EXPECTATIONS

- possess the knowledge, capabilities, and dispositions to organize and provide instruction at the appropriate school level for the study of the theme/key concept
- provide developmentally appropriate experiences as they guide learners in the study of the theme/key concept; building upon learners' prior knowledge, experience, and capabilities

CURRICULUM STANDARD Theme/Key Concept	**LEARNER EXPECTATIONS**	**SCHOOL APPLICATIONS** • **early grades** • **middle grades**
Culture & Cultural Diversity	comprehend multiple perspectives that emerge from within their own culture and from the vantage points of the diverse cultural groups within that society and with whom the society may interact	• focus on cultural universals • study in-depth specific aspects of particular cultures
Time, Continuity, & Change	understand their historical roots and locate themselves in time; draw on historical knowledge to make informed choices and decisions in the present	• sequencing to help establish a sense of order and time • beginning level of a formal study of history so that learners can continue to expand their understanding of the past and of historical concepts and inquiry
People, Places, & Environment	understand the world in spatial terms and posses knowledge of place, location, region, movement human interaction with the environment; make informed and critical decisions about the relationships between human beings and their environment	• use learners' immediate personal experiences to have them reflect upon elements in their environment and how we use and think about the environment • relate personal experiences to other environmental contexts
Individual Development & Identity	know the factors that contribute to who they are; to what they think, feel, and believe; to what they decide and do; to why they are likely to make certain decisions and act in particular ways, and to how they perceive themselves, their abilities, their personality, and the world	• provide opportunities to examine the personal changes that have occurred to and in them over time • apply psychological concepts and principles to describe and explain their personal, social, emotional, physical, and cognitive development
Individuals, Groups, Institutions	know how institutions are formed, what controls and influences them, how they control and influence individuals and cultures, and how institutions can be maintained or changed	• examine various institutions that affect their lives and influence their thinking (e.g., family, school, church, etc.) • examine ways institutions change over time, promote social conformity, and influence cultures
Power, Authority, & Government	understand the historical development of structures of power, authority, and governance and their evolving functions in American society as well as other parts of the world; become effective problem-solvers and decision makers when addressing persistent social problems encountered in public life	• explore learners' natural and developing sense of fairness and order as they experience relationships with others • apply rights and responsibilities in specific contexts

CURRICULUM STANDARD Theme/Key Concept	**LEARNER EXPECTATIONS**	**SCHOOL APPLICATIONS** • **early grades** • **middle grades**
Production, Distribution, & Consumption	understand how and why resources are distributed; understand how the role of government in economic policy-making varies over time and space; understand that increasingly, economic decisions are global in scope	• differentiate between wants and needs • use economic reasoning processes in addressing issues related to the fundamental economic questions • apply economic knowledge to societal conditions as they analyze economic issues, formulate economic values, and develop decision-making capabilities
Science, Technology, & Society	realize that both science and technology have influenced and been influenced by individuals, societies, and cultures	• consider how inventions have altered the course of history and how society has employed technologies to modify the physical environment • identify examples how science and technology have transformed individuals' lives and social institutions and how they have changed people's perceptions of and beliefs about the natural and social world
Global Connections	understand the increasing important and diverse global connections among world societies	• build on learner first-hand experience and those presented to them through the media to help them to become aware of and to understand how they are affected by events on a global scale • initiate analyses of the interactions among states and nations and their cultural complexities as they respond to global events and changes
Civic Ideals & Practices	prepare for full participation as a national and global citizen	• establish classroom rules and expectations; determine how to balance individual and group needs • evaluate the relationships between ideals and practice; take civic roles in the school and local communities

How Can Social Studies Learning be Assessed?

Teachers need to understand the relationship among curriculum goals and objectives, content, learning activities/experiences, and assessment/evaluation. All four of these criteria must, in turn, be developmentally appropriate to the learners' prior knowledge, experience, and skill ability. In my social studies methods courses, I stress the development of internally cohesive units (and lesson plans) that systematically reflect on and explain these relationships. The preservice and in-service teachers have to develop a unit evaluation plan or narrative statement of their evaluation philosophy. The plan must include a description of the assessment techniques used in the unit with an explanation of why they are the most appropriate techniques for the unit, based on the needs of the learner and the level of concepts being taught. The multidisciplinary and multimodal nature of social studies as well as the desired pursuit of conceptual rather than just procedural (fact-based) knowledge demand a system of multiple and meaningful assessments of student learning. This point is reiterated in a 1993 report from the South Carolina Center for Excellence in the Assessment of Student Learning:

> Clearly, the curricular and instructional shift in social studies education from transmission of discrete facts and isolated pieces of information to integration of content and cognitive functions, requires new strategies for assessment of student learning. The assessment of development in moral and social cognition is also important. Such outcomes are not easily assessed through traditional paper and pencil tests and at times may only be evident in completed projects and through students' outward behaviors, like their effort and enthusiasm for the project or their commitment and objectivity while investigating an issue (p. 3).

Effective social studies assessment techniques (e.g., Ellis, 1995) include:

- "I Learned" or "I Experienced" Statements in either written or oral form
- Interviews/Conferences
- Observation
- Summary Sheets (student review of learning over a group of lessons or during a period of time)
- Checklists (includes specified learning outcomes/objectives for a task or lesson)
- Anecdotal records
- Attitude scales (used to determine student's achievement motivation)
- Essay tests
- Objective tests
- "I Search" or research papers
- Portfolio assessment: daily work samples; various data entries (research notes, graphs, surveys); stories and essays; rough and final drafts; group/cooperative projects; journal entries; tests; teacher feedback; personal reflections on growth; etc.

Conclusion

Teaching and learning in social studies shares with other disciplines and fields of study the following pedagogical principles:

- teaching and learning involves the transmission, transaction, and transformation of knowledge and skills

- teaching and learning involves both procedural and conceptual knowledge
- teachers need to continuously assess and use students' prior knowledge and experience in knowledge construction and skill acquisition
- knowledge construction and skill acquisition must be approached in developmentally appropriate ways
- teachers should empower students to see and evaluate recurring themes across disciplines and subject areas
- multimodal teaching and learning requires authentic and multiple assessments.

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Helping Students Learn Mathematics through Careful Sequencing of Problems and Questioning of Students' Thinking

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Significant mathematical tasks and discourse have been identified as important attributes of good mathematics teaching (National Council of Teachers of Mathematics, 1991). Part of the work of good teachers, therefore, is careful selection of tasks and skill at managing discourse in the classroom. The purpose of this paper is to provide several illustrations of sequencing and questioning that seem to support students in improving their understanding of mathematics. Since solutions to problems need to be "debriefed" with students, it is virtually unimaginable that careful sequencing and questioning can exist independent of each other. Teachers must be skillful both at posing critical problems and in helping students understand and internalize problem solutions.

Example One: Counting-on

Part of the way that students learn mathematics is through solving sequences of problems that stretch their thinking and help them learn to use more sophisticated strategies for solving problems. Teachers can be helped in their thinking about sequencing problems when they have understanding of frameworks for both content and students' thinking. These frameworks generally evolve from deep thinking about the content and from research on students' thinking.

Cognitively guided instruction (CGI) provides one set of frameworks for primary grades arithmetic. In the process of implementing CGI (e.g., Fennema, Franke, Carpenter, & Carey, 1993), teachers are given opportunities to understand one framework of problem types and another framework of students' solutions to those problems. As teachers struggle with understanding and using these frameworks, they have to rethink their perspectives on teaching (e.g., Bright, 1996). There are a few less well established frameworks, such as the van Hiele levels of thinking in geometry (e.g. Fuys, Geddes, & Tischler, 1988) and ways of interpreting information in graphs (e.g., Bright, Curcio, &

Friel, 1996; Friel, Bright, Frierson, & Kader, 1997), but for many critical areas of mathematics (e.g., fractions, ratio/proportion, functions) there is very little help for teachers in understanding how students solve problems.

The framework in CGI for children's thinking, for example, suggests that there are three general "stages" for many children's solutions to word or story problems:

- direct modeling: All of the numbers in the problem and the solution are modeled with some external tool, such as counters or tallies.
- abstract counting: One or more of the numbers are held in memory without being modeled, while other numbers in the problem may be modeled with some tool.
- derived facts: Known number facts are used and modified to create a number fact that is useful for solving the problem.

Suppose that a group of children have been solving problems by direct modeling. Even as the numbers increase in magnitude, they continue to model all of the numbers in each problem. What can a teacher do to help these children move on to a "counting-on" strategy (one example of abstract counting)? One approach would be to pose the following sequence of join-change-unknown problems. (This is one of the eleven types of addition/subtraction problems that are posited by the problem types framework in CGI.)

Jane had 10 baseball cards. For her birthday, she got 3 more baseball cards. How many baseball cards does she have now?

Jane had 20 baseball cards. For her birthday, she got 3 more baseball cards. How many baseball cards does she have now?

Jane had 25 baseball cards. For her birthday, she got 3 more baseball cards. How many baseball cards does she have now?

Jane had 28 baseball cards. For her birthday, she got 4 more baseball cards. How many baseball cards does she have now?

Through discussion (i.e., discourse) and careful management of tools (e.g., manipulatives) the teacher might be able to highlight counting-on strategies. For example, if all of the children solve the first problem through direct modeling, the teacher might (a) give students only 10 counters to use so that they would be physically unable to model both the 10 and the 3 simultaneously or (b) ask students to try to solve the problem using a hundreds board. If even one student demonstrates counting-on, the teacher can highlight that solution strategy and focus children's attention on how this strategy is different and how it may be quicker by not requiring so much time to count out all of the cubes.

If no student demonstrates this more sophisticated strategy, the teacher might want to ask questions like, "What is one more than 10? What is the number after 10? What is two more than 10? What is one less than 10?" to focus children's attention on the sequence of counting numbers. Then the students can return to solving more problems like the first one above.

The second problem above helps children transfer their counting-on strategy to larger numbers, but still starting at the beginning of a "number decade" for which it might be easier for children to continue counting. The third problem makes another small transfer to us of counting-on beginning in the middle of a decade. The fourth problem makes a significant transfer to help children learn to use counting-on across number decades. Children often hesitate as they think about what comes after a "nine number," so even though they might successfully count-on from 25 to 28, they might not count-on successfully from 28 to 32.

The use of "small" numbers as the second addend in these problems in an important part of choosing these tasks. Counting-on two or three numbers is much more likely to happen than counting-on 12 or 13 numbers. Too, the use of 1 as the second addend may only elicit memorized rote counting (e.g., knowing that 21 is the number after 20 in the counting sequence) and may not actually involve counting-on.

Example Two: Struggling with Questioning versus Telling

In a study of preservice elementary mathematics teachers, Vacc and Bright (in press) note the struggle of one preservice teacher during the last month of her student teaching experience in balançing "questioning" and "telling" during a lesson on perimeter. Apparently, Helen (a pseudonym) did not hear exactly what she expected in one student's response to questions, so Helen "took over" the lesson by imposing her thinking on the lesson.

> Prior to the following segment, Helen had indicated that everyone was going to use a piece of string and had asked how they would use it to determine the perimeter [of the room].
>
> Deanna: You could take the strings and go around the room and then take the ruler to see how long each string was, so you'd know how long the string was to count how long they are.
>
> Helen: Okay, to see how many inches or feet there are?... Okay, do we need to use the ceiling?
>
> Deanna: No.
>
> Helen:" We can use what?
>
> Tien: The floor.

> Helen: The floor. Anywhere, really; you can use the wall. I think it would be easiest, well I don't know. It might be easier to use the wall. Whatever you want to use.... You all came up with some good ways to figure out the perimeter.... I'm going to give each two people a string ... [and] assign you a wall.... So, if you had this wall, where are you going to start.... So one partner -- I need a volunteer -- will hold it there? So Sandy is going to hold it there and I'm going to bring it around here. How many strings is the wall so far?... Okay, you let go of your end, Sandy, and bring it around the wall. How many strings is that?
>
> Although Deanna's response indicated a clear understanding of how the room's perimeter could be measured, it appears Helen believed that she needed to demonstrate the process before the students could proceed on their own. (Vacc & Bright, in press)

Helen's comments in her long monologue at the end of this segment indicate her struggle with knowing when to question and when to tell. She seemed to want to acknowledge students thinking (e.g., "You all came up with some good ways to figure out the perimeter.), and yet she seemed to think that focusing their attention on measuring around the walls would somehow make the task easier or more understandable for the students. This particular student teacher had been mentored for almost two years by a faculty member who emphasized the importance of letting children construct their own understandings of mathematics concepts. Yet, Helen "couldn't resist" putting in her own two-cents worth as a means of trying to help students by "short circuiting" their own struggles with attaching meaning to the concept of perimeter. Children do not think in the same ways as adults, so if they are to internalize important mathematical understandings, it is probably important that we help them make sense individually rather than simply try to parrot what adults say and do.

Example Three: Using Place Value Knowledge

Place value is a critical part of the understanding of our number system; teachers typically spend a lot of time trying to help children internalize place value ideas. Sometimes, however, it is difficult for us as adults to understand subtle differences in problems that might inhibit students' learning of place value. Consider the following two multiplication problems:

Mike had 12 rows of 4 tomato plants. How many tomato plants did he have?

Mike had 4 rows of 12 tomato plants. How many tomato plants did he have?

These two problems have the same mathematical structure, and most adults would solve them in very similar ways. But for children who are struggling to understand place value, these problems might have very different effects on their understanding. At the start, both problems might be modeled (either with physical materials or with drawings) by showing some form of a grid or by making sets of the same size.

In the first case, there might be 12 sets of 4 elements; for example, 12 sets of 4 tallies each. Since there are now 48 individual tallies, about all a child can do is count them one at a time. (At the point of determining a final answer to a problem, very few children seem to see the need to "group by tens" as a preliminary to counting all of the objects.) There is virtually no opportunity for a child to make use of place value knowledge; modeling of the problem simply does not support use of that knowledge. It is not surprising to observe teachers pose a problem like this one and then be surprised that children do not use the place value knowledge that teachers have seen them use in other contexts. It is the problem itself, however, that inhibits the application of this knowledge.

In the second case, there might be 4 sets, each containing a "10 bundle" and 2 individual tallies (e.g., either through use of base ten materials physically or through schematic drawing of base ten materials). Since there are 4 tens visible in the display, a child is likely to first count the tens (e.g., 10, 20, 30, 40) and then count the individual units that remain (e.g., 41, 42, 43, 44, 45, 46, 47, 48). The child is more likely to apply place value knowledge simply because the structure of the problem supports use of that knowledge.

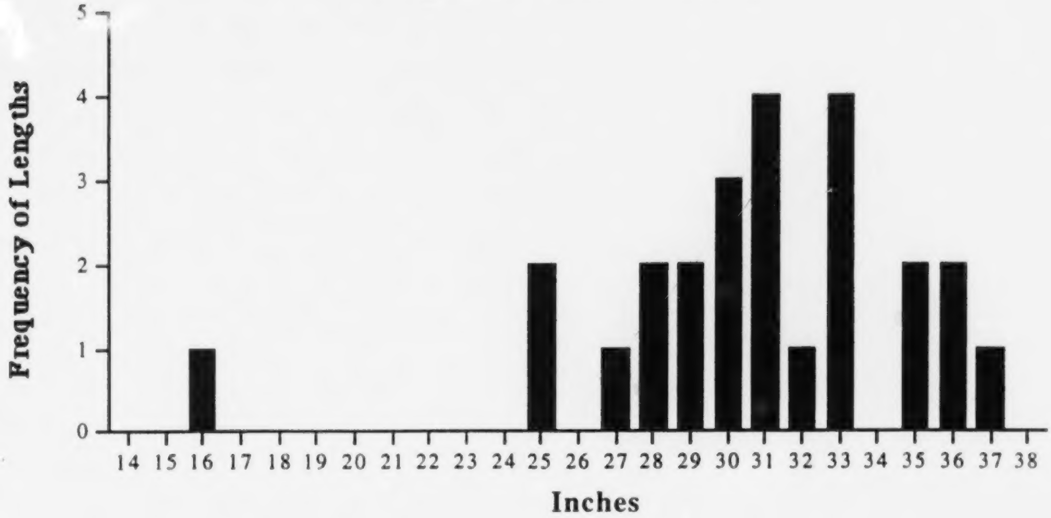
Example Four: Questioning about Graphs

In instruction on graphs, several authors (e.g., Bertin, 1983; Curcio, 1987, 1989; McKnight, 1990; Wainer, 1992) have identified three levels of questions that students might be asked to help them understand and interpret information in a graph: an elementary level which focuses on extracting data from the graph, an intermediate level that involves interpolating and finding relationships in the data as shown on the graph, and an overall level that involves extrapolating from the data and interpretation of the relationships identified from the graph.

In the context of a standard bar graph below (Friel & Bright, 1995), these three levels are illustrated by the following questions:

1. How many cats are 30 inches long from nose to tail? How can you tell?
2. If you added up the lengths of the three shortest cats, what would the total of those lengths be? How can you tell?
3. What is the typical length of a cat from nose to tail? Explain your answer.

Lengths of Cats in Inches



Posing questions of all three types helps students focus on the information in the graph by (a) making sense of the visual characteristics of the graph, (b) identifying relationships embedded in the context of the situation, and (c) transferring those relationships back to the real world setting. These questions become a sequence of increasingly sophisticated mathematical problems for students to solve.

Although many middle grades students' responses demonstrate understanding of the information, their responses also reveal a number of important confusions: (a) the bars may be interpreted as representing individual cats, (b) the shortest bar may be interpreted as representing the shortest cat, (c) labels on the x-axis may be interpreted as occurring in order by time, and (d) the data set may be equated with the set of labels on the x-axis. Many of these confusions were observed both before and after a unit on graphing, so they appear to be somewhat resistant to change.

Concluding Remarks

Questioning is a powerful tool both for helping teachers obtain information about students' thinking and for scaffolding students' development of understanding. Teachers need to think carefully about the initial questions that they ask at the beginning of a "debriefing" of solutions to a problem. But perhaps more important, teachers need to develop skill at creating probing questions that will not only reveal students' thinking but also help students to reflect on their thinking. Teachers have to create these questions in real time during interactions with students; developing skill at knowing what questions to ask does not necessarily happen quickly or without considerable frustration, but it is an important technique for helping students learn mathematics.

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Learning Technology and Other Things

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Like most disciplines, technology skills can be learned either conceptually or concretely. Conceptual learning is more difficult, but more rewarding. Concrete learning is the default value. When teachers learn to use technology, they often demand that the trainer write steps for them to follow. This reflects the teaching of technology as "training." In contrast, through out this paper, I will highlight the imparting of conceptual knowledge as teaching and true education. I will refer to training as the metaphoric dumping of "the concrete" (e.g., facts) into a student's head.

Aside from the obvious lack of conceptualization involved with following steps, a new problem has arisen. With older DOS-based computers, the steps remain constant: turn the computer on, type in this command, type in that command. With Graphical User Interfaces, however, things are not always in the same spot! A professor once asked me to help fix his computer. The reason he needed it fixed was that a housekeeper had moved his icons. His steps began with "double-click the second icon on the right." After the rearrangement, the icon was the third on the right. This highly educated man could not open his word processor since the picture was moved one inch.

There appears to be a phobia associated with learning technology skills. This problem often relates to a lack of conceptualization. My high school students were given two class periods of instruction on using a computer before they were set loose to complete fifteen assignments over the course of fifteen weeks. At first, they all were lost and begging for assistance. By the second assignment, they did not believe they could complete the assignment without help. In a particular case, the first assignment included copying and pasting a paragraph from one page to another in a word processing document. In the second assignment, the student was asked to copy and paste a number from one cell to the next in a spreadsheet. I asked the student how he copied and pasted in the word processor, and he responded, "I can do that, but this isn't a word processor. What does the word processor have to do with a spreadsheet?"

Anyone who is proficient with a computer understands that the functions in these two assignments are quite similar. For the students, however, what was missing was a concept. Conceptualization is part of true mastery, but for a neophyte computer user, the generalization is not yet formed. A student does not believe that the knowledge of using one program can be applied to another. In that same high school class, some students often complained that they had to learn to use fifteen different programs. The students who eventually passed the course, however, ceased to complain about the number of programs; they realized that they didn't need to learn fifteen programs. Students were required to complete similar tasks in each program and so the knowledge of one program empowered them to use another.

I would like to point out a direct connection with science education. While teaching biology and chemistry, I witnessed similar reactions. During the portion of class devoted to teaching about diversity of life, I directed students to write notes about the evolutionary-significant differences between dissected specimens of a variety of animals. These students had studied and passed a test on the evolutionary developments in hearts, lungs, jaws, and musculature. The students noted that one specimen of a reptile was missing an eyeball. For the test, I asked them to identify specimens of these same classes of animals. The students all mis-identified the reptile. When I asked why it was so hard to identify the specimen as a reptile, they told me, "It wasn't fair. You didn't use the reptile with the missing eyeball. How are we supposed to identify it if you switch the specimens?"

Chemistry students actually went as far as to complain when the chemicals were stored in different containers. The assignment was to follow a procedure to chemically identify a compound. The students had seen potassium chromate several times previously. The tests run were very easy to interpret. The students mis-identified potassium chromate (even though it was the only purple compound). They complained "It wasn't fair. Every time we saw potassium chromate prior to now, it was in a thick glass container with a glass stopper. This time is was in a plain flask. How can you expect us to identify it if you switch containers."

In each of these examples, the students took the easiest route. They identified the peculiarities of a specimen instead of internalizing the overarching concepts. The reptile was obviously a reptile because of its heart and skin. They chose the peculiarity of the specimen since it was easier. Potassium Chromate is purple and has a characteristic set of reactions. The students chose the shape of the container since it was an easy identification. The students chose to believe that cut and paste was a set of steps for a specific program. In each case, the students learned (or memorized) the peculiarities instead of the generalities.

Another way this trend plays out is through brand loyalty in software. While running an open-use computer lab, students would often come in wanting to type a paper. Often when asked which word processor they use, they responded Windows 95. When the student sits down at the computer, they are lost when they are faced with Microsoft Word (a close guess to the meaning of Windows 95). It turns out that the student had always used Word Perfect. The students only needed to type, print, bold and underline. These functions occur similarly with the two programs. The icons are slightly different although the menus and concepts are similar.

To many people still using Microsoft Word version 4.0, the thought of upgrading to the 1997 version is scary. Why is this so? The menus are almost the same. The icons are the same. The possibility of the steps having changed is small. Altogether, the problem is an issue of comfort level. We do not see many people who are afraid of replacing a broken toaster. They have generalized that to use a toaster, you place the bread in a slot and press the button. With the computer, they have not generalized that the print command will be under the file menu. We see a systemic acceptance of this lack of generalized knowledge.

On both the North Carolina 8th grade Computer Competency Exam and the Essential Technology Skills Inventory for North Carolina Teachers, the test is designed to be administered using the software package the participant used while in training. So what is being tested? To be blunt, it is how well people can use their favorite software to complete basic functions. I sincerely doubt that a driving test must be administered using the car a person learned to drive. It is readily accepted in industry that to implement an updated word processing program requires large-scale training. Why is this? I would assert that it is in part because they are trained instead of educated. Training implies steps to be memorized while education implies concepts to be internalized.

One common missing concept is that of file formats. This is particularly true for Macintosh-using students. In the Macintosh world, it is common to double click the icon of a file to open it. The computer recognizes the application information stored with the file and launches the application to open the file. This activity is transparent to the user. Now imagine what happens when the program used to produce the file will not launch on its own. On final exams where I have purposely disabled this ability of the computer, students become lost. I have seen students be unable to complete an exam, even though instructions were written on the exam . This occurs because the student consistently repeated the same process: double-click on the file to open it. The instructions written on the exam say to launch the application and then open the file. This is an example of the problems with "pragmatic conceptualization."

While working with a computer specialist who was self-trained, these issues became clear. He had conceptualized some precepts about the computers. In many cases they were wrong, but they explained for him what he had seen. He had only been exposed to computers that were supplied with network cards from the manufacturer. Although he had replaced network cards before, he could never get the computer to accept cards from another manufacturer. His pragmatic conceptualization was that only cards from that manufacturer would work. The reality was that each manufacturer sets defaults in their cards. He had never seen anyone adjust the setting on the cards and so didn't know that such a process was possible.

In other instances, I have seen perfectly intelligent people hold their hands over their heads while printing. When asked why, they responded, "The computer works better this way." Another example is students who place a disk in the computer and save their work. They are later upset to find that their work is not on the disk. The student never told the computer to save their work on their disk, only to save it. A final example related to this pragmatic conceptualization is the student who "lost" her work. The student used the same computer each day. She always found her file by looking at the list of recently used files associated with the word processor. One day, the student used a different computer. Her file was no where to be found. She really didn't know what she had named the file either. She expected that since the file was on the menu on one computer, it would be on the menu of each computer.

These are all examples of operationalized generalizations. Often students pragmatically accept exceptions as the rule. This happens very often when a void is created in their schema. The void exists since they had been trained rather than being given a conceptual basis for their actions. Such voids can occur from pragmatic learning (I tried it and it worked), or through strict skills-based training (use the index finger on the right hand to press the left button on the object). Although many students and adults avoid learning concepts about technology, they are still humans. Their brains still use the same patterns of knowledge acquisition for technology as they do for other disciplines. Part of that pattern is the conceptualization of knowledge. If students only remember steps for technology use, they rapidly become lost if even the most minor change has occurred.

What is the solution? The solution in the case of technology is the same as that in any discipline. Students will have a hard time grasping what they can not see. So to begin with the concepts alone increases the learning curve. We should start with a single word processor. The trick is to start with one that has few quirks from the generalizable concepts. The introduction and assignments related to it should highlight the overarching concepts of word processing. As proficiency in the use of the generalized concepts within the single application grows, the quirks should be pointed out. Then another view of the same concept should be introduced; for example, a lizard with both eyes intact. Introducing this change while students are still focused on the generalizable issues is important. Later more in-depth activities can be used to highlight the individual eccentricities of certain programs.

This system has several advantages. First, the comfort level with varying flavors of technology is improved. Students are not made to feel that the differences among programs and computers are insurmountable issues. This crucial approach is lacking in most commercial learning packages for technology. These packages highlight the features of a single program much as a car dealer tries to convince you to buy his high priced car. Second, the natural progression of knowledge to the conceptual level is fostered. Science education expends great effort un-teaching concepts students have pragmatically acquired. Students will develop concepts. It is better for them to develop concepts that are accurate. It may be true that printers work better with your arms over your head, but this pretense will not help one in the world. Third, the better grasp of concepts that the student has, the less unknown there will be. Often people are afraid of technology. This fear seems similar to the fear of the dark. Often what actually occurs inside a computer is just as mysterious as the darkness. When students and others know the concepts behind the imposing face of a computer, they are more likely to feel they have some control over how they interact with it. It is this sense of control and being able to predict outcomes that empowers them to master the area instead of continuing to be trained.

It is clear from this discussion that I fall squarely on the side of conceptual knowledge acquisition as a model for technology education (and for most other disciplines). The next issue is the assessment of knowledge and skills. Earlier, I stated that many tests are designed to measure the level of students' skills. Although multiple choice items dealing with concepts are included on the two previously mentioned standardized tests, they are not a major focus of the tests. Preservice teachers preparing to take a final exam (in an introductory computer course) report more stress over the practical section of the test than the multiple choice section. (They say they are used to passing multiple choice tests on content they do not know, but the practical means they actually need to know how to do something.) When working with High School students, I always made a point to ask the students to perform functions on their final exam using a program they had never seen before. The first time I used this method the students were furious and the parents complained that the exam was unfair. They were quieted and accepted the exam, however, when they reviewed the objectives of the course. The course objectives dealt with students' knowing how to use a computer without being tied to a single package. By testing students' concepts of how computers and computer programs function, a true assessment of the critical factors was made. A more general defense for this form of assessment was presented to an irate parent. When I finally said, "You know how computers keep changing? Do you want me to make sure your child can use them next week or be sure he has to use the same program for the rest of his life?"

The true test of technology skills is to ask students to do something or use a tool they had never used before. In this way, we are assessing students' concepts of technology. When using familiar tools, we are assessing students' familiarity with the tools. There is no other discipline where we expect students to be assessed in the manner we assess them in technology. In mathematics, we don't assess students' abilities by asking then to solve the same problem they have solved several times. We change the numbers or reword the problem. In science, we know not to ask students to name the sections of the place mat they used to learn the weather cycle. Instead, we present them with a different representation and ask them to identify parts of the cycle.

In many ways the teaching of technology reminds us of several lessons we may have forgotten. Foremost of these lessons is that true learning takes place at the higher levels of Bloom's taxonomy. The higher order thinking skills help to ensure that what is taught is useful to students. The other lesson is that we must test what we want students to learn. If we only test skills using a specific tool, like a graphing calculator, we are providing an unfair assessment. Students with graphing calculators of the same model at home will have had more practice on the tool, and thus score better. If we were really concerned with developing skills on TI-95 calculators, this would be appropriate. Since we probably are interested in the higher levels of Bloom's taxonomy, we need to assess a student in a "tool practice" independent method.

English Studies

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How do students learn English? Cambourne (1988) offers a model of oral language learning in young children that also serves as a model of literacy development in reading and writing and across grade levels. The primary features of his model are immersion, demonstration, engagement, expectation, responsibility, approximation, use, and response. In short, students learn English studies through continual interaction in a rich language and print environment which affords extended periods of time to engage in literacy development through reading, writing, speaking, listening and thinking.

The role of the teacher cannot be discounted in this process, however. The teacher devises experiences, conducts demonstrations, sets expectations, and chooses materials which promote active engagement in language and literacy development and build students' independence and responsibility for learning. Also, the teacher helps to extend students' knowledge of conventions and appropriateness of various language forms through demonstrations and feedback on their attempts to approximate language processes and products (Atwell, 1987; Mayher 1990; Moffett, 1968).

Students learn the content of literature in English classrooms usually through extended reading and analysis of the traditional genres: short story, poetry, novel, drama, and non-fiction (Applebee, 1974). Each genre also has traditional and contemporary content and concepts with which students become familiar. For example, students become acquainted with the traditional structure of short stories such as that encountered in the writings of Poe or O'Henry with clearly discernible features of exposition, complication, climax, and denouement through reading and analysis of a broad range of conventionally structured stories. However, students also learn that post-modern experiments with story structure fracture it beyond recognition through immersion in works such as those by Italo Calvino or Julio Cortarzar. *And* students read short stories for fun, some suggested by the teacher, some recommended by other students, some self-selected. The processes of engagement in and analysis of story structure build students' concepts of mystery, detective story, fairy tale, legend, and other types of stories which they may then choose to approximate in their own writing (Applebee, 1978).

Through immersion in the Cambourne model of literacy instruction in a language rich classroom, students learn to recognize one genre from another and learn to identify the specific features of each genre, both traditional and experimental. Through the act of reading, students develop concepts of genre structure even before they learn specific terms to identify specific features. The teacher and textbooks then identify elements and supply terms for them such as rhyme, meter, stanza, tone, mood, and others in poetry. Students learn the features of poetry which still attract readers to "Beowulf" and Lewis Carrol's "Jabberwocky," as well as Maya Angelou's "Harlem Hopscotch." They recognize the differences between Petrarchan and Shakespearean sonnet form, yet know that Linda Paston's unconventional "Ethics" is also poetry. They come to understand why, even as young adults, they love for their twelfth grade English teacher to read aloud Shel Silverstein's "Where the Sidewalk Ends." They come to understand that some poems look and sound more like prose than poetry and that some prose looks more like poetry than prose. They find that Lincoln's Gettysburg Address and Martin Luther King's "Letter from A Birmingham Jail" still move readers because their subject matter speaks to people's hearts through finely crafted poetic expression. *And* students read poetry for fun, appreciating not only the content of self-selected reading but the craft of the author.

In a language rich environment in an English classroom, students study novels, both classics and contemporary young adult literature. They come to recognize the similarities and differences between the short story and the novel and even poetry in terms of plot, theme, setting, characters, mood, and tone. They look for similarities and differences among books and other pieces of literature written in different cultures and at different times. They study works such as Twain's "Huckleberry Finn," Elie Wiesel's "Night," S. E. Hinton's "The Outsiders," Walter Dean Myers' "The Scorpions," and Annie Dillard's "Pilgrim at Tinker Creek" to see if Faulkner was right when he said in his Nobel Prize acceptance speech that the only thing worth writing about is "the human heart in conflict with itself" (1950). *And* students read books for fun, analyzing the authors' crafts and unique qualities of style.

Through immersion in language rich English classrooms, students also read newspapers and "read" television and movies and other non-print media to discern how information and misinformation and disinformation can be used to persuade people to do or buy or believe something, thus impacting society for better or worse. *And* students "read" newspapers and television and movies and other non-print media for fun.

Students engaged in an immersion model of English studies, however, find that studying English goes beyond the subject matter of forms and discourse conventions.

The study of literature in all its various forms introduces students to the world, moves their spirits, informs their minds, and gives them models for their own writing. Learning definitions of onomatopoeia and alliteration or identifying terza rima rhyme scheme from rima royal serves no purpose as a "body" of knowledge itself. Studying literature in English classes undergirded by the principles of immersion and engagement is a matter of making connections. They generate and respond to provocative questions: How does the experience of the characters relate to your experience? Do you see ballad form in your favorite popular music? How does a different experience of the characters inform you about situations and places you never may encounter directly? How does the use of the alliteration in this piece make you feel? How did the author craft the structure or the language to evoke this feeling in you? What did the character say or do that caused you to draw that conclusion? What did you learn about the craft of writing from this author's example? These are the kinds of questions that help students understand why learning concepts in literature are important beyond that of passing an end-of-course test. *And* knowing concepts and features of literature can make other reading fun.

Although composition is often taught in isolation from literature and grammar and more often as a kind of "crisis preparedness drill" three weeks before a writing test, students learn writing best in conjunction with the study of literature. Through demonstrations and modeling, teachers help students to recognize features of good writing as they read literature of other authors and then apply those strategies to their own pieces of writing in process. In the course of recognizing and then applying different writing techniques, students develop their own writing repertories from which they draw strategies for composing other pieces. For example, teachers demonstrate to students how authors compose interesting leads (introductions, beginnings, etc.) and ask students to apply those kinds of leads to pieces in process to see which would be more effective for individual pieces. Students then draw on their repertoire of leads to make effective decisions as writers of future pieces by approximating the practices of other authors as they ask themselves, "Should I begin my piece on Rosa Parks by telling where and when she was born, or would it be more interesting to start with the bus driver telling her she had to move to the back of the bus?" This basic composition pedagogy can then be applied to other important writing concepts such as arrangement of interesting organization that helps a reader understand what the writer has to say; generation of interesting detail, but not too much and not too little; use of effective verbs whether active or passive as appropriate; as well as construction of powerful conclusions that leave a reader happy to have read the piece (Calkins, 1986; Newkirk & Atwell, 1988).

However, composition in high schools is too often dominated by one genre: the essay of literary analysis. Rather than immersion of students in a broad range of writing experiences which help them develop their abilities as writers, writing pedagogy is dominated by the teaching of formulaic writing based on rubrics for evaluating a standard writing test imposed by state agencies or college boards (usually some variation of the five-paragraph essay). No wonder students are reluctant to "engage" in writing.

The study of language correctness in grammar, spelling, punctuation, word use, and vocabulary are best learned through immersion, engagement, demonstration, and use within the context of writing. Years of study have proven time and again that traditional skill and drill grammar exercises taught in isolation have little to no effect on the improvement of writing or oral language ability (Braddock, Lloyd-Jones, & Shoer, 1963; Mellon 1969). In fact the skill and drill approach actually causes harm in that it fills time which could be used more productively in reading and writing acts and actually harms students' motivation to engage in English studies generally (Hartwell 1985; Hillocks 1986). Yet, year after year dutiful teachers sincerely troubled by their students' lack of knowledge of standard English grammar march through Warriner's English Grammar book exercises like Sherman through Georgia. Students need to know important grammar concepts such as complete sentences, yet understand that a deliberately used, well-placed fragment can be very powerful. They should learn proper agreement of verbs with subjects and pronouns with antecedents; correctly placed modifying words, phrases and clauses; proper punctuation; and spelling, but only within the context of and application to writing and formal oral discourse, not as an isolated body of knowledge for its own sake. If skills and concepts regarding correct language use are not approximated by students in their own constructions of language, then the study of correctness in standard English is rarely useful to students.

A true immersion model of student-centered language arts instruction in English such as that described by Cambourne provides ample opportunity for use of literacy skills and genuine student response, especially when students have the freedom to extend their literacy practice across disciplines. The language arts of the English class are the same language arts that students engage in other disciplines: reading, writing, speaking, and listening. Also, the processes involved in English studies are virtually the same as those of any other discipline: decoding, analyzing, defining, clarifying, interpreting, comparing, evaluating, synthesizing, composing, and others. Extending English studies to include integrated, interdisciplinary learning which brings reading and writing together in a broad range of genres on a common subject with ample opportunities for students to pursue their own related research interests automatically becomes a rich opportunity for immersion and engagement in literacy and language (Marzano, 1991).

For example, students in an eleventh grade class studying Knowel's A Separate Peace in an immersion model of literacy and language development research the culture of the U.S. at the time of World War II to learn what Gene and Phinneas and the other boys at Devon School might have been interested in at the time. The students develop a radio program of swing music from the "big bands" of the era, find out why women's fashions had broad shoulders and short skirts, analyze the appeals of war recruitment films and posters and create their own, investigate the new revelations about the "surprise" attack on Pearl Harbor and develop their own response to it, map the flight of Amelia Earhardt and draw their own conclusions about what happened to her, study popular sport figures of the time, and read popular young adult literature of the kind the characters in the novel might have read. The teacher may provide direct instruction and demonstration in the skills of identifying and interpreting the biblical and military symbolism of the novel. But these students set goals and fulfill expectations for their own learning, they assume responsibility for learning because they have opportunities to engage in their own research interests, and they approximate the forms and standard language use of other published texts because they are invested in the ownership of their responses. These students engage in reading which is stimulating and purposeful, centered in research and writing about topics they choose for themselves, and which cross the boundaries of the disciplines naturally. *And* they have fun.

Tchudi (1988) underscores the value as well as the joy of extending learning across the disciplines in a rich immersion model of literacy instruction when he writes:

> interdisciplinary, inquiry-centered learning often includes something which has been ignored in a great many recent reform reports: the joy of learning. By "joy" I do not mean the "fun of easy gratification and quick laughs," but the genuine joy of mastery, the pleasure of gaining control. The same intellectual joy can be found in the mastery of language and learning.

The importance of generating "fun" in learning language cannot be discounted.

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Incorporating Music in an Integrated Curriculum for Teacher Preparation

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Challenge: Walk down the halls of any elementary school building. Hypothesis: Probably the classrooms that will draw your attention are the ones from which music emanates, whether it be the lilting children's voices singing the latest social consciousness song (e.g., "I Believe I Can Fly"), the robust blare of students as they play a marching piece, or the rhythmic pulsations of a prerecorded multicultural folk song. Analysis: None of the previously mentioned occurrences are situated in the "music" rooms. In every instance, the music springs forth from regular classrooms.

Often music is taught in isolation by music specialists in vocal music or instrumental rooms. "A school curriculum that is teacher-centered, fact-oriented, and textbook-dominated presented in isolated periods of time with no connection among the various subject areas is no longer a realistic curriculum for the future" (Akey & Gilbert, 1990, p. 4). This does not have to be the case with the elementary classroom teacher. Current curriculum development practices have stemmed from beliefs that what children learn in schools should be relevant, going beyond the memorization of facts and enabling them to synthesize and apply knowledge in meaningful ways (Erickson, 1995; Jacobs, 1989; Relan & Kimpston, 1993). As educators, we look to approaches designed to shift or alter our thinking about, not only what to teach and how to teach effectively, but what students need to learn.

Ways to take on the challenge include curriculum integration or interdisciplinary approach. In this paper, the two terms will be used interchangeably. However, the following definition is offered: "Interdisciplinary: A knowledge view and curriculum approach that consciously applies methodology and language from more than one discipline to examine a central theme, issue, problem, topic, or experience" (Jacobs, 1989, p. 8). As part of an integrative approach, music, as well as the other fine arts, can and should be an integral part of the daily curriculum.

> A good classroom is geared to music. Caring about the whole child means honoring all aspects of their musical expression. An awareness of the

> values of musical encounters provides the wise teacher with many choices and worthwhile possibilities for immersing children in a rich variety of songs, finger plays, and other musical experiences. (Edwards, 1997, p. 92)

A means by which preservice teachers can develop skills and strategies to foster the creative and artistic abilities of children in their future classrooms is to participate in a teacher education program course designed

> to enhance the creative and artistic abilities you bring to the experience, your perceptions, memories, feelings, concerns, attitudes, and values about the arts.... When you have found your own creative and artistic spark, you will be better equipped to help children engage in the creative process. (Edwards, 1997, p. 7)

This paper is written from the different perspectives of observer, participant, and co-instructor of a lab (process-oriented) course for elementary preservice teachers entitled "Music for the Classroom Teacher." The objectives of the course were: "*actively experience* and apply the musical concepts and skills developmentally appropriate for elementary students; acquire skills, resources and *motivation* for integrating music in the classroom; and develop personal musical knowledge, skills, beliefs, and *enjoyment*" (Edwards, 1998, p. 1). The scheduled activities and assignments addressed each objective quite adequately. I observed total classroom participation almost 100% of the time, even from college students who saw themselves as nonmusical.

During nearly every class session, the preservice teachers had numerous opportunities to actively engage in singing (i.e., piggyback songs, scale songs), playing instruments (i.e., percussion, recorder), and exploring movement (i.e., creating variations of movement to a particular beat or type of music). They also utilized their acquired knowledge and skills by constructing and teaching songs or rhythmic games for their grade level interests. Weissman (1986) remarked that "moving rhythmically helps development coordination and spatial concepts while encouraging creative movement" (p. 37). Further, the concepts of order, organization, and discipline are perceived by children involved in rhythm activities (Weissman, 1986).

The preservice teachers examined resources for integrating music into the classroom including using children's literature (e.g., Going to A Pow-wow) and guided listening activities (e.g., video about Maria Tallchief, Native American ballerina). One of the course assignments required them to develop an instructional unit of five lessons utilizing music and present one of the lessons to their colleagues. Writing thematic units for topics like, Community Helpers, Studying North Carolina, and Body Parts demonstrated their ability to integrate music with various subject areas. Caine and Caine (1993) posited a brain-based approach to learning and teaching which supports the need for finding meaning, a principle identified as a key component of integrated curriculum.

> Designed to perceive and generate patterns, the brain resists having meaningless patterns imposed on it. By meaningless we mean isolated pieces of information that are unrelated to what makes sense to a particular student. When the brain's natural capacity to integrated information is acknowledged and invoked in teaching, vast amounts of initially related or seemingly random information and activities can be presented and assimilated. (p. 11)

Multicultural songs and games occupied a section of the course. The preservice teachers were exposed to musical contributions from diverse cultures, such as African, Native American, African American, and Latino. They were also encouraged to use culturally-specific terminology and to refrain from the use of stereotypes in lyrics and movements (e.g., singing "Ten Little Indians" and making war whoops, attributed to Hollywood). Anderson and Lawrence (1998) explained the importance of studying a variety of music in the following manner:

> American schools traditionally have encouraged study and appreciation of different cultural groups. Social studies, geography, and history curricula have directed attention to the contributions of many peoples of the world, and teachers at every grade level have sought to bring multicultural viewpoints to their classrooms. Reflecting this concern for keeping in touch with the international age in which we live, teachers have increasingly endeavored to present a greater variety of music representative of many different cultural groups. (p. 405)

Learning to accompany one- and two-chord songs on the recorder, autoharp, piano, and baritone ukulele initially was a frightful and unsettling experience for some preservice teachers. However, affirmations from the instructors plus rehearsals enabled all of them to gain some proficiency on the instruments, especially the recorder which the college students had purchased. These experiences led most of the preservice teachers to form the belief that a classroom teacher is not limited to utilizing only pre-recordings.

An extended class activity in which all preservice teachers took part was an observation of a general music class taught by a music specialist. The purpose was to familiarize them with music teaching techniques currently being used, and add those techniques, whenever possible, to their own teaching approaches. Other outside-of-class music opportunities included Orff and Kodaly workshops. I presented a Swahili greeting song, "Jambo," linking it to children's literature with a cultural mathematics and language arts focus at the

"Multicultural Songs, Games, and Stories" workshop sponsored by the North Carolina Kodaly organization. It was refreshing to participate with others who value music and its benefits, whether they were music specialists, classroom teachers, or college students.

There are many benefits of an integrated curriculum. Some of these are an increase in the level of interest, especially if teachers are allowed to develop their areas of personal interest and concentration (Relan & Kimpston, 1993); helping teachers become facilitators and guides (Galeota-Wozny, 1995; Martinello & Cook, 1992); and encouraging teachers to use their imagination. The process is stimulating, motivation, and exciting (Akey & Gilbert, 1990; Jacobs, 1989).

My role as a co-instructor allowed me to share mini-lessons on multicultural music and activities, through the use of domestic equipment as instruments and transition songs. Making oral contributions to class discussions was inspired by my experience as a former elementary teacher for 17 years. During those years I integrated music in various capacities and forms to reinforce a concept (e.g., singing an addition rap song), enhance a lesson (e.g., children creating simple songs centering around a theme), expand students' knowledge base (e.g., creating sounds at different volumes with instruments), and develop an appreciation of diverse musics (e.g., playing multicultural music that required movement). My continued application of this procedure permitted me to observe a heightened sense of motivation and participation from the children. They demonstrated transfer of knowledge by recalling previously learned information and seeing relationships between subject areas and music. Lipson, Valencia, Wixson, and Peters (1993) stated, "an integrated knowledge base generally results in faster retrieval of information, more flexible problem solving, and better concept transfer across content areas" (p. 254).

In 1994 the Goals 2000: Educate America Act was passed. As a result, the Consortium of Arts Education Associations was formed "to write voluntary national standards for what the outcome of arts education should be-that is, what students should know and be able to do in the arts at various grade levels" (Edwards, 1997, p. 13). One of the nine content standards for school music programs advocates that students should comprehend the connection between music and the other disciplines (Edwards, 1997). "Children can be taught to perceive ideas that are related throughout their learning environment. They will discover that fundamental musical concepts-such as unity through repetition, contrast, and balance-are inherent in many subject areas" (Anderson & Lawrence, 1998, p. 3).

Curriculum integration is not a guaranteed "cure all" to the educational dilemmas faced today. However, integrating curriculum, especially with music, offers a viable alternative to instruction, so that it is synthesized and not fragmented, meaningful and not insignificant, collaborative and not individualistic, and observable and not assumed.

Coherence and meaning is given to other academic subjects through music. Activities and resource materials are available to classroom teachers, especially nonmusical educators, to integrate music. Preservice teachers, by taking advantage of music courses offered as a part of their teacher education program, have the opportunity to develop skills and strategies to improve the curriculum concepts being taught in an enjoyable and natural manner.

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Learning to *Do* Science: Are Science Fairs the Key to Success?

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The science education reforms in the 1960s spawned by Sputnik all stressed inquiry. The recently released *National Science Education Standards* (1996) does the same. The command is that science must be taught not only as content but as process. Doing science -- science as a verb -- must be given at least as much consideration as knowing science -- science as a noun. Science educators also refer to these two segments of science as process (doing) and product (knowing).

However, science is still taught mostly as a body of knowledge from B-PreK to Ph.D. (Birth to Pre-Kindergarten to Doctoral studies). In Kindergarten we teach and students learn to distinguish between living organisms and non-living entities. Post Ph.D., I try valiantly to determine appropriate ways to teach that content to my students. The best I can do is, when out on the playground or on the school nature trail with a Kindergarten class, point to a tree and ask if big trees make seeds or nuts that make little trees? Kindergartners aren't sure. Then I hear a plane overhead and ask if big planes, jets, can make small planes or helicopters? Again, some kindergartners aren't sure. Certainly life experiences will eventually help most people, but probably not all, to make this distinction. In Kindergarten we will of course collect nuts and seeds and match these to trees and talk about how plants grow. Whether or not this is useful or important information is another issue altogether.

Now in Kindergarten we return to the classroom and get measuring tapes. After identifying trees by the shapes of their leaves, we find the "biggest" tree of a specific type and we measure around it at a given height. We find other trees of the same kind and measure around these trees at the same height. We also figure out how far the "smaller" trees are from the bigger trees. We inquire about the mechanisms for seed dispersal. We are *doing* science. Of course, doing science and knowing science are intimately linked in the scientist's mind, and science educators would never advocate abandoning one for the other or teaching one instead of, or in lieu of, the other.

These strategies and techniques are extended from Kindergarten into elementary school classes where students examine tree cores and propose climatic events that might explain specific core observations. In the middle school students might collect, identify and label a seed collection while in high school and college, students investigate variables that lead to maximum growth of kudzu and design ways to slow its growth.

The problem is that what I have described above does not occur in most classrooms across the United States. It certainly does not occur in many classrooms in North Carolina. In elementary school classrooms, what occurs with regard to science is not much. In many classrooms across the state, science is no longer a subject or a discipline. Science is rarely mentioned, much less taught. Science has never managed to be taught as inquiry or process in most classes. Each year that I have been in North Carolina has brought a decline in the amount of time, energy and effort devoted to science teaching and learning.

Take a typical case. Most of you have probably met Mrs. Zajac. In case her name has slipped your mind she became well known to the general public when Tracy Kidder first introduced her nearly 10 years ago (1989) in *Among School Children.* But don't worry if you haven't met her or you've forgotten her; Mrs. Zajac is everyone's fifth grade teacher. She's nice, she's fun and she cares about kids. Just ask them. But Mrs. Zajac is not a very good science teacher. In the course of a day,

> she left science for last. For several other subjects she used textbooks, but only as outlines. She taught science right out of the book; this was one of those texts that takes pains with the obvious and gives the complex short shrift. Chris didn't know much science and didn't usually enjoy teaching it. About one day in ten she canceled science altogether and announced ... an informal art lesson. She often felt guilty about science. (p. 32)

During the course of a school year, Tracy Kidder profiles only *one* science event from Mrs. Zajac's class: The Science Fair. Mrs. Zajac gives her kids an hour or more every day for three weeks to get ready for the science fair. Mrs. Zajac sends letters home (one side in English, one side in Spanish) asking parents to help their children with their science fair projects. Mrs. Zajac clearly explains the rules for the science fair: form teams or work alone, chose a topic, write a report on the topic, and finally construct a demonstration for the science fair. Then, surrounded by a generally disappointing bunch of reports, Mrs. Zajac assigns grades, based, not on the projects, but based on what the children had learned. Quickly though she realized that the grades she had assigned did not really reflect what the children learned as much as they reflected what the children's parents knew.

In classrooms around the country but particularly in this state and in numerous classrooms in Guilford County the same situation is repeated year after year after year. The last remaining remnant of science in many elementary school classrooms is the annual school science fair.

However, there are many, many, many problems with school science fairs not the least of which seems to be a clear correlation between children's grades on science fair projects, children who win science fair competitions and how much children's parents know. Science fairs are problematic because children ask trivial questions or no questions at all. They are often misguided or not guided at all by their classroom teachers. Many children, like all of those in Mrs. Zajac's class, simply prepare a report. The focus of science fairs seems to be one of form versus substance (nice, word processed trifolds for every child but because volunteers do not understand the nature of science the investigative experience itself is usually sorely lacking). Too many science fair projects resemble the projects of Mrs. Zajac's fifth graders: Kimberly and Courtney planned to "put these foods on the table and tell 'em what they are." Irene and Mariposa planned to "get a lot of rocks from around *their houses* and figure out their environment" (p. 275). For Mrs. Zajac, a first rate science fair project was a report filled with accurate facts about dinosaurs. To Mrs. Zajac's credit she recognized the problems with science fairs.

> She might as well stop grading this event.... The whole event looked like a rigged election, distressingly predictable, as if designed to teach the children about the unfairness of life.... Maybe science fairs worked in other schools. But this kind of event had no place at this school anymore. She'd go to Al (the principal) afterward and tell him they had to rethink the whole thing. The faces of the losers looked not exactly sad but distant ... many of the losers watched with slightly opened mouths, like children gazing through the window of a toy store. She'd go to Al tomorrow. They couldn't let this happen again next year. (p. 279-285)

The larger question is at what age, grade, and developmental level can children comprehend the nature of scientific inquiry and actually conduct an investigation? How much help do they need and it what forms should it come prior to that maturation level? Are science fairs in the zone of proximal development for K-5 elementary school children or are science fairs far beyond that zone? Are science fairs worth it, or, do they do more harm than good?

Given the culture of elementary school teaching, the nature of helping to prepare future elementary school teachers, and the end of yet another semester of science education for the elementary school, about the most headway I can make in science education is that with proper school-based assignments preservice teachers realize that children do love science and that both knowing and doing science is fun. Because we don't make them memorize it, take a computer test on it, work on it four hours a day, do the same thing day after day, and because they don't take an end of the year test or nine week criterion based tests, children still like science.

So, what are some alternatives to school science fairs?

- Invent America (broader scope, some of same problems)
- School Learning Fair (all disciplines including creative writing, art and music)
- A Fair of Science (where the notion of investigation is not so narrowly defined and reports with demonstrations are OK)
- Science Circus or Carnival
- Star Party
- A Day in the Tropics
- Real, Meaningful Class Science Fair Projects
- No prizes, or shared prizes
- An awareness of scientists (i.e., Richard Feynman) who turned down prizes and relinquished memberships in prestigious science organizations like the National Academy of Science because the function of the organization was to "see who else was worthy to be let in" (Sykes, 1989)
- Training or educating elementary school science specialists who themselves are truly knowledgeable of the methodologies used in the sciences by scientists themselves which would require an extended apprenticeship with a willing and able scientist
- Connecting curriculum across disciplines to design appropriate events that highlight students' understandings and inquiries in an engaging and affirming and encouraging way

Inquiry yes, science fairs no! I fear that if elementary schools continue to focus science instruction and science activity around a traditional school science fair that what little science is left in schools will quickly disappear because the science fair clearly leaves a bad taste in most people's mouths. Given the seeming popularity of science fairs in North Carolina elementary schools, one would expect to locate a fair amount of research on this topic. Most of the studies located point to problems with science fairs including those detailed in this paper. A few but unconvincing number of studies indicate that participation in science fairs leads to increased interest in science and appreciation of science, and a higher level understanding of the nature of science. We are poised now in North Carolina to return to kit-based science study. Until kit-based science study replaces text-based science study, I would advise an alternative to the Science Fair.

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Learning About -- and From -- Learning in the Social Studies

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Preparing a discussion paper on the social studies for this conference provides an opportunity not only to learn about conceptions of learning in the social studies curriculum and field but also to learn from the discourse within the field about valued outcomes and ways of learning and knowing. The field of social studies education is broad and often diffuse. Its history has been marked more often by rhetorical heat than by pedagogical light, and the relatively scant body of research in social studies education has been regularly and roundly criticized for its quality and contributions (Shaver, 1991). Until recently, the kinds of questions about student learning, task structures, assessment, and transfer that served as a guide for this conference seldom have been asked in the social studies. Instead, the field has spent its energies in debate over the purpose and place of the social studies in the larger school curriculum and in often politicized argument over worthy knowledge within the social studies curriculum. The level of sloganeering and generality in social studies discourse makes good argument -- and artifacts -- for studies in epistemology and conceptual analysis. Indeed, one reason for the low levels of contribution by research in the social studies has been the loose language and imprecision in defining outcomes and variables for study. For example, one whole set of studies of National Science Foundation funded curriculum projects and the "inquiry" method found non-significant differences between treatment and contrast groups largely because the contrast groups were defined as "traditional" teachers, a configuration often indistinguishable from the "inquiry" teachers (Ponder, 1979).

The Social Studies Curriculum

History traditionally has formed the disciplinary centerpiece of the social studies curriculum, followed at some distance by political science and geography, at some farther distance by Economics, and then at still greater distance by a number of fields, including anthropology, sociology, psychology, emerging fields like multicultural education and global education, and even religious studies. The social studies take as their legitimate teaching and learning outcomes such diverse areas as decision-making, affective goals like empathy and moral development, social and political participation, and understanding of global issues and cultures, as well as the more general categories of important concepts, principles, and processes of inquiry shared with other fields. In curriculum policy, the social studies has been marked by the tension between history conceived as a tradition of "archivism" -- a culturally conserving force -- and the contrasting notion that the social studies should provide a basis for good citizenship rooted in rigorous questioning, skepticism, myth-debunking, and social criticism rather than loyalty to tradition, hero-making, and duty to authority (VanSledright, 1995).

Since the 1930s, the social studies curriculum organization has been known as "Expanding Environments," denoting the spiraling (some would say "repetitive") pattern of beginning in early grades with the study of family, moving to neighborhood, community, state, nation, and world, then repeating the pattern of state, nation, and world in various ways through high school. In 1994, the National Council for the Social Studies (NCSS) developed a set of curriculum standards (NCSS, 1994). This set of standards has been revised and updated and now appears on the NCSS web site (www.ncss.org) as *Toward Excellence in the Social Studies: Curriculum Standards for the Social Studies.* These standards define social studies as

> the integrated study of the social sciences and humanities to promote civic competence. Within the school program, social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world. (NCSS, 1994)

In addition to defining social studies as "integrated study," the NCSS *Standards* provide ten thematic/conceptual strands to serve as a planning guide or to permit inferring the social studies thematic curriculum from expanding environments models still in use:

- culture
- time, continuity and change
- people, places and environments
- individual development and identity

- individuals, groups, and institutions
- power, authority, and governance
- production, distribution, and consumption
- science, technology, and society
- global connections
- civic ideals and practices

Each of the ten themes has a standard and a set of performance expectations for early grades, middle grades, and high school.

Questions for the Conference

1. What types of learning are most important for social studies?

While social studies in practice too often has been marked by a focus on "arid," disconnected facts, social studies education has long used the broader categories of "concept," "principle," and "skill" within the cognitive domain. Attitudes or dispositions also have been historically important in social studies education, as have civic competency and activity.

The knowledge category of "concept" in social studies typically is defined as "a word or group of words that label a category of like elements." "Map" and "book" are both examples of concepts, as are the more recent and complex organizing concepts of "exploration," "culture," or "power". The themes in the current social studies *Standards* are all concepts or combinations of concepts. Concept learning consists primarily of becoming more sophisticated and proficient in the cognitive operation of progressive discrimination using examples and non-examples of the concept. Examples and non-examples can be presented and analyzed either in a direct instruction or discovery manner, with later examples and non-examples containing more subtle critical and irrelevant attributes than earlier ones. The process of concept learning can be "spiraled" through the curriculum, so that, by the secondary grades, the process of attribute analysis can be used to analyze very complex concepts such as "colonization" or "imperialism" when the power relationships between colony and colonizer are subtle or unclear. In this sense, the process of attribute analysis becomes the content of the problem-solving or social analysis process.

The richest research tradition in social studies is that of studies of learning concepts. The seminal studies were those of Hilda Taba, done in the 1960s in the San Francisco Bay area. The Taba studies led to a model of teaching concepts known more widely as the "Taba model." This set of studies anticipated later studies based in a constructivist paradigm and elaborated a constructivist approach which Taba labeled as "discovery" learning. In those studies, Taba and her colleagues examined the thinking of elementary school children as they encountered a curriculum designed to promote conceptual learning (Parker, 1991). Martorella (e.g., 1991) has provided the most regular attention to learning concepts in the social studies through his syntheses of research. In addition to concepts, the field of social studies values learning of the processes of inquiry. In more recent work on learning history and the social studies, theorists and researchers consistently take a constructivist view and put "students, rather than the facts" at the center of the learning process (VanSledright, 1995). This "new history," developed through the history standards project at UCLA, asks students to sift evidence and form interpretations like historians. It even asks them to question the conclusions and objective "facts" developed by selected historians whose works they read. Thus, even the concept of "fact" has been raised to a problematic level.

"Principles" in the social studies occur in several forms. A "principle" generally is defined as "a statement of relationship between two or more concepts." Thus, "might makes right" or "the price of liberty is eternal vigilance" are both examples of principles. The knowledge category of "principle" has several subcategories. A "hypothesis" is an untested principle, while a "generalization" is a tested principle with broad explanatory power. Principles also look syntactically like "facts" and involve the use of questions as means to test hypotheses or to question generalizations that have reached the level of "truth" or conventional wisdom.

"Skills" in social studies have been seen in several ways. There are essential "basic" or "tool skills" like decoding and making inferences that are necessary for learning and meaning-making, procedural skills like map-reading or graphic analysis (charts, political cartoons, etc.), and inquiry skills related to the social science disciplines or to history. In recent years, curriculum documents such as the North Carolina Standard Course of Study have defined social studies skills as (a) acquiring information from a variety of sources, (b) using information in problem solving, decision making, planning and construction of new knowledge, (c) constructive group participation and interpersonal relationships, and (d) effective civic participation. This definition of skills is as much a set of goals as skills definitions, and appears to come at least as much from the domain of political rationale as from efforts at psychological or pedagogical clarity in defining or learning "skills."

2. What kinds of student tasks are best for helping students acquire particular content in social studies?

Many social studies tasks can involve the "manipulatives" of artifacts and primary sources. Like many science and mathematics projects (e.g., CGI), the advocacy literature recommends instruction (or better, learning settings) that use artifacts (e.g., photographs, tools and implements, pottery, paintings, and other cultural realia) and primary sources (e.g., letters, diaries, original maps) to provide opportunities for developing thinking. The NCSS standards also follow the notion of authentic tasks and learning focused on student thinking. (Developing and refining mental models is a refrain in the performance expectations.) Again, however, there is, as with math and science, a wide gulf between theory based on cognitive science and classroom practice.

Students in social studies classes share many kinds of academic tasks with other school subjects. They read, write, and use mathematical operations to calculate time or distance. They share concepts and operations such as sequencing, spatial analysis, and relationship inquiry. In the social studies, sequencing typically occurs when students are learning about chronology through time lines, which are similar to number lines in mathematics. They learn spatial analysis in geography lessons with latitude, longitude, and other mapping concepts that bear much similarity to graphing and other similar mathematics operations. And they inquire into relationships between people in ways similar to a literature class and between phenomena and institutions in ways similar to science.

3. How can each type of content in social studies be assessed?

Assessments in social studies vary widely. Some outcomes -- like social or political participation -- are difficult to measure. Case studies of classroom practice (e.g., VanSledright, 1995) in which the researchers or teachers ask students to describe and justify their thinking and reveal their prior knowledge are scant and in their infancy. In general, social studies outcomes are assessed largely through observation and listening (in the early grades) or through student description or example generation, either in writing or verbally. In practice, the norm still is the "objective" test.

4. How do students internalize content in social studies?

The answer to this question is a key to understanding policy questions and practice questions in the social studies in coming years. A set of recent research studies by Brophy, VanSledright, and Bredin indicates that students gain social studies (especially historical) knowledge from a variety of places, including school, television, cultural centers such as museums, and family (e.g., VanSledright, 1995). Because the knowledge is often transmitted in story form, and because there are great gaps in the "story," students fill in the gaps through "imagination and fanciful elaboration," so that the distinction between reality and fantasy is blurred. Recall, if you can, how confusing it might be to a young child whose first story of the Declaration of Independence came through the Disney cartoon feature "Ben and Me," in which many of the events and inventions in which Benjamin Franklin played a major role were attributed in whole or part to a cartoon mouse. This view of the elaboration of incomplete knowledge is similar to studies of learning science. Further, since students (especially adolescents) often see school as irrelevant, and social studies (especially history) as really irrelevant, students see no reason to study social studies, especially history, which they see as maybe relevant at some distant future time. Social studies in general are episodic and "flat-terrain" in a curriculum mapping sense, so students internalize content in episodic, nonsystematic, and unchronological ways. In thematic, interdisciplinary learning, knowledge is internalized in more holistic and nondisciplinary ways. In both cases, there is no real sense of accumulating a growing base of knowledge in social studies. Nor is the knowledge apparently useful in any way except as school learning or as more complex and interrelated social problems presented by teachers and textbooks. Powerful teaching and learning requires more conscious and intentional metacognitive structuring to internalize social studies content in useful, meaningful, and transferable ways.

5. What mechanisms are established in the research literature for helping students transfer learning of content within social studies or from social studies to other disciplines?

The general answer to this question is that there are few, if any, studies in social studies that deal with the transfer question. The field has used the standard studies on transfer and learning to develop frames for social studies learning. A thumbnail summary of strategies for knowledge and concept development, including keyword mnemonics, imagery, and advance organizers, can be found in Martorella (1991).

The curriculum vision for the social studies contained in the 1992-97 documents by the National Council for the social studies is one of "powerful" social studies teaching and learning. These documents indicate that "powerful" teaching and learning will be characterized as "meaningful, integrative, value-based, challenging, and active." These attributes are to suffuse the use of the ten social studies curriculum standards, and content integration within the social studies and across curriculum domains is to be a conscious and intentional goal of instruction.

Conclusion

social studies Education shares with other disciplines and fields of study a number of content categories, instructional methods, academic task structures, and assessment procedures. There are great possibilities for conversation and connection across disciplines and teaching fields. Mathematics, science, and technology concepts, principles, and skills can be practiced, extended, and questioned in social studies classes. But there have to be conventions and support for making explicit the "expectations of patterns" that this conference concluded could help learners, teachers, and teacher educators organize knowledge for learning.

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Development of an Elementary Social Studies Methods Course

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The purpose of this paper is to present ideas for discussion in the development of an elementary social studies methods course for preservice teachers. Although not comprehensive in nature, this paper briefly outlines the theoretical framework of the course, goals and objectives, activities and projects, and assessment measures that will be utilized and modeled as best practices in the social studies. Through the presentation of the course design the intention is to reveal (a) the types of learning that are most important for preservice teachers to engage in and be exposed to as future elementary social studies educators, (b) tasks that match theoretically the goals and objectives of the course and will assist preservice teachers in acquiring content knowledge, instructional practices, and appropriate attitudes and beliefs necessary to be effective social studies educators, and (c) assessment measures that are theoretically based and will contribute to our knowledge of how we can best promote professional growth in preservice teachers. By taking a close look at some of the course activities and projects, it becomes clear how this course will encourage preservice teachers to view and present the content of elementary social studies and how to make connections that will allow for transfer of knowledge both within the social sciences and with other disciplines.

Theoretical Framework of Course

As I design a course to prepare preservice teachers to be effective social studies instructors within the elementary school (K-6), I plan to build a rationale for a holistic, integrated, interdisciplinary approach to the social studies curriculum. The theory of constructivism will provide an underlying framework to assist in this task. Constructivism is a theory of knowledge and learning; it focuses on what "knowing" is and how one "comes to know" (Fosnot, 1996). According to constructivism, knowledge is described as that which is temporary, developmental, nonobjective, internally constructed, and socially and culturally based (Fosnot, 1996). From this perspective learning is viewed as a selfregulatory process where a sense of the world is constructed through synthesizing new experiences into what one has previously come to understand. We are in constant search for tools to assist us in understanding our experiences, and new insights occur through reflection upon our interactions with objects and ideas (Brooks & Brooks, 1993).

Learning is understood to be a constructive activity that students themselves have to carry out. Therefore, the task of the educator is not to dispense knowledge but to provide students with opportunities and incentives to build their current knowledge (von Glaserfeld, 1996). The goal of instruction is not behavior and skills, but concept development and deep understanding. This would require that social studies instructors find ways to invite their students to experience the richness of our social world, empower them to ask their own questions and seek their own answers, while challenging them to understand the world's complexities through the social science disciplines. Operating from within the constructivist theory, elementary preservice teachers should view the social studies curriculum as a tool for them to use to invoke curiosity, exploration, and inquiry within their students, with the memorization of facts as subordinate to learning how to find information to solve real problems (Brooks & Brooks, 1993).

There are several related principles, ideas, and theories that support the constructivist theoretical framework that will be developed, emphasized, and infused throughout this social studies methods course. The theory of multiple intelligences (Gardner, 1983, 1993), multicultural education (Banks, 1993; Gay, 1994), holistic and integrated elementary curriculum (Charbonneau & Reider, 1995; Steffey & Hood, 1994), and authentic assessment Charbonneau & Reider, 1995; Gardner, 1993; Goodman, 1977) will contribute to our understandings of how elementary students best internalize and demonstrate learning within the content area of the social studies. All course activities, assignments, and discussions should lead preservice teachers toward (a) the understanding that children should be active participants in the learning process, (b) an awareness of the emotional, social, cognitive, and physical developmental needs of children and how they influence the learning of social studies content, and (c) a commitment to providing learning experiences in the social studies that are designed to challenge and celebrate the multiple intelligences and cultural perspectives of each child while making connections to other disciplines both inside and apart from the social sciences.

Goals

There are many goals that I would like to accomplish through this course. The first goal is to introduce preservice teachers to the content of the social studies by familiarizing them with the Curriculum Standards for the Social Studies created by the National Council of Social Studies (NCSS) and to the North Carolina Social Studies Standard Course of Study. When using these tools for planning, it is important for the preservice teacher to recognize the high standards that are set for learning, and be committed to implementing those high standards within their classroom. The second goal is to assist preservice teachers in focusing on the purposes of the social studies; namely, to facilitate in students the abilities to solve community problems, reason historically, appreciate diversity, discuss and think about issues of the global community, protect the environment, and develop and practice democratic and citizenship values. Brophy (1990) gives a comprehensive review of the various perspectives of the purposes of the social studies held by social studies educators. A third goal is to encourage active involvement by the preservice teachers in the methods course by stimulating critical thinking about social studies planning, instruction, and assessment; allowing experimentation with a variety of teaching strategies within the class and in field placements; and allowing preservice teachers to experience appropriate instructional methods in a variety of grouping structures.

A fourth goal for this course is to develop a global, multicultural perspective in the preservice teachers. In order for preservice teachers to be prepared to deal effectively with the children they will find in their classrooms, it is imperative that this type of perspective be nurtured and stimulated. Preservice teachers must be required to reflect on their own ethnic group membership and understand how this can shape their interactions with children and parents. They must examine their own attitudes about racial and cultural differences and, through group discussions and reflections on field experiences, come to terms with the implications of these attitudes (Banks, 1993). If we want preservice teachers to be committed to teaching each child that enters the doors of their classrooms, then they need to accept, value, and celebrate the diversity that they will surely experience within the public schools (Gay, 1994). This course will also seek to develop reflective practitioners (Schon, 1983). Teachers need to constantly inquire, reflect, and act intentionally in order to improve their social studies content knowledge and practices within their own classrooms.

A fifth goal is to integrate technology, literature, mathematics, science and communication skills effectively into the preservice teachers experience with the social studies methods course, and to encourage them to do the same in their own teaching. Preservice teachers must strive to teach for transfer. Teaching for transfer means finding ways to organize instruction to assist learners to take advantage of transfer, seeing how one thing applies to another, how they might use widely what they are learning, and how they can understand one thing in terms of another (Tishman, Perkins, & Jay, 1995).

Course Objectives

The preservice teacher should be able to:

1. Utilize the North Carolina Social Studies Standard Course of Study for instructional planning
2. Demonstrate the knowledge, skills, and attitudes of the social studies from an array of fields known as the social sciences: psychology, sociology, economics, political science, geography, history, and anthropology
3. Engage in reflective practices that will stimulate critical thinking regarding the instructional practices of social studies teaching
4. Demonstrate the ability to plan an instructional unit around a social studies topic or theme that is developmentally-appropriate, meets the needs of students in terms of learning styles, exceptionalities, multiple intelligences, and multiple perspectives. It should also include appropriate objectives, instructional methods, and assessment measures.
5. Identify and evaluate instructional software that will support social studies program, such as simulations, databases, CD-ROMs, Hyperstudio.
6. Identify and use children's literature that will support social studies program, such as historical fiction, books that have multicultural themes, books that assist in developing character values and citizenship.
7. Identify and evaluate community resources that will support and extend social studies program
8. Demonstrate knowledge and skills in the use of a variety of grouping strategies such as collaborative pairs, cooperative groups, peer tutoring, and pair reading.
9. Demonstrate knowledge and skills of effective use of (a) graphic organizers in instruction to promote transfer and (b) concept maps and webbing techniques in their own integrated planning
10. Identify a variety of assessment procedures and demonstrate their appropriate use in class and in field placement
11. Locate and share information from professional journals, professional organizations, and the INTERNET to stimulate professional growth and development in the social studies

Course Projects and Activities

The following are some of the projects and activities that will be used to achieve the goals and objectives outlined above.

1. Students will be asked to think about their own ethnic heritage by completing family history reports. After they are presented with the read-aloud of The Patchwork Quilt, students will extend this activity by creating a family quilt square that contains symbols that represents their family background, culture, values, beliefs, heritage, etc. The students will briefly explain the significance of the symbols on their square, and then the squares will be joined to represent both the diversity and the unity within the class. It is extremely important for students to explore and come to understand their own culture and ethnicity in order to be able to begin to appreciate others' ethnicity and culture.
2. Students will create a Hyperstudio stack of a geographical region. They will incorporate the five themes of geography into an interactive stack for students of any preferred grade level (K-6) to use. The students will include a paper that gives detailed information about the goals and objectives of the stack, the assessment measures, and ways they would incorporate this resource into their social studies program. The class will share their projects with one another, and if possible use all of the stacks to create a world almanac to take and use. Students will be allowed to work in self-determined groups of 2-3 on this project.
3. The class will create a database of community field trip resources related to the social studies. Each student will be responsible for researching and visiting a possible field trip site within the local community. Each student will fill in predetermined fields, within a database of information, concerning the field trip site. Each member of the class will get a copy of the completed field trip database. In addition, as an e-mail journal entry, students will plan a mock field trip to the site that they have researched and visited. The entry will include justification for the trip that shows how it aligns with curriculum goals and objectives of a particular grade level, activities planned to prepare students for field trip, and extension activities to be completed at the conclusion of the trip. They will also have to think through the events of the day and specify what they can do ahead of time to make sure the trip runs smoothly.
4. Preservice teachers will choose a famous American woman or minority in history to research and present to the class. They will be responsible for providing

biographical information as well as communicating how this person has contributed to history. These reports will be done in the form of oral, dramatic presentations, where the student will become the character. Students will be highly encouraged to also do their presentation in their field placement. The students will prepare a one-page handout of researched information to share with the members of the class.

5. Professional Development Project: Students will have a choice of one of the following two options:
   - A. Review of Professional Literature: Students will read five articles from current, professional education journals or professional organization publications. A summary of each article will be written, including a section expressing how the content of the article can be applied to elementary social studies teaching. The instructor will provide a resource list to assist students in locating appropriate journals.
   - B. Attend Professional Conference: If a conference is to be held at some point in the semester, students will be informed of the location and time. Preservice teachers will write a brief summary of the sessions they attended and reflect on how they believe what they experienced and learned will assist them in social studies education.
6. Integrated Social Studies Theme Unit or Curriculum Project: Preservice teachers will be required to design an integrated thematic unit around a social studies topic. The unit will include (a) goals and objectives (tied to standard course of study), (b) webbing map (including subject areas of mathematics, communications, science, social studies, technology, art, music) to show integrated planning, (c) seven lesson plans - at least one lesson planned using the multiple intelligences lesson plan page (provided by instructor), (d) unit resource list (e.g., children's literature, reference books, community resources, technology), (e) assessment strategies, and (f) one page reflective writing describing the process of planning the integrated unit, new understandings, and ideas for future unit plans. It must be clear in the lesson plans how the teacher will attempt to meet individual needs of students, especially those with exceptionalities. The lessons will be evaluated based on whether they are developmentally-appropriate, integrated, illustrative of multiple learning styles and perspectives, tied to standard course of study, and keyed to components of an effective lesson. Students will be required to teach at least one of the lessons from their integrated unit in their field placement. They will videotape the

lesson and write up a self evaluation.

7. Preservice teachers will engage in an action research project related to the issue of diversity within their field placement. The preservice teacher will formulate a question and devise a plan of action that requires systematic data collection, reflection, and analysis in order to increase knowledge, change attitudes, and/or improve teaching practices. The preservice teachers will submit a final action research report that includes their proposed action steps that are result of their new understandings of diversity gained from project.
8. As an on-going component of this course, children's literature that reflects social studies concepts as well as multicultural perspectives will be shared and discussed.

Assessment

As I think about the goals I have set for this course, I must also consider how will I assess whether the preservice teachers have achieved them. The projects and activities presented will allow me to determine the level of mastery for many of the goals and objectives set forth.

I intend to be very in tune with the attitudes and values that the students communicate throughout the course as a way of perceiving any changes in their perspectives. By listening to and carefully observing the preservice teachers, I can gain valuable knowledge to assist in curriculum development and in evaluating their progress. The idea of being a "kid-watcher," understanding that observation is the basic component of assessment comes primarily from the work of Goodman and Goodman (1978). An advantage I have through the Professional Development School (PDS) program at The University of North Carolina at Greensboro is that I will also be supervising this same group of preservice teachers within their PDS placements and will see first hand how they interact with students, teachers, and administrators. I will also be able to observe their instruction, which will allow me a wealth of information about how what they are learning in the methods course is being carried over into their practice. In addition, I will be working with this group as they put together their teaching and technology portfolios, which will give me another insight into their growth as preservice teachers.

In terms of multicultural perspective, a multicultural belief survey will be administered to the preservice teachers at the beginning and end of the course. These data will allow me to determine how the course has contributed to changing their beliefs regarding multicultural teaching and learning. I also plan to hold several focus groups at the conclusion of the course to find out which components of the course were most influential in bringing about change in the preservice teachers' beliefs and understandings of a multicultural perspective.

Through this course design, effective social studies assessment techniques will be modeled and practiced by the preservice teachers. The preservice teachers understanding and implementation of establishing a system of multiple and meaningful assessments of student learning is the desired outcome. The preservice teachers will be introduced to and engaged in the following effective social studies assessment strategies (Ellis, 1995; Steffey & Hood, 1994): "I learned" or "I experienced" reflection statements, interviews/focus groups, rubrics, observation, anecdotal records, group/cooperative learning evaluations, e-mail journaling, attitude scales, essay tests, objective tests, portfolio assessment, and research projects.

Conclusion

The major principles and underlying theories of this social studies methods course are primarily focused on our evolving understandings of the teaching and learning process in general. Therefore, the major concepts and pedagogical implications presented are easily transferred into any discipline and content area. There are certain principles of learning and teaching that are universally applicable to promote academic achievement in students, and the fundamental vision of all disciplines should be that students are thinkers, creators, and constructors of content knowledge.

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Integrative Instruction: Success and Frustration in Teaching against the Grain

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> But teaching against the grain is also deeply embedded in the culture and history of teaching at individual schools and in the biographies of particular teachers and their individual or collaborative efforts to alter curricula, raise questions about common practices, and resist inappropriate decisions. These relationships can only be explored in schools in the company of experienced teachers who are themselves engaged in complex, situation-specific, and sometimes losing struggles to work against the grain. (Cochran-Smith, 1991, p. 280)

In her eloquent plea for encouraging preservice teachers to "teach against the grain," Cochran-Smith also documents some of the complexities inherent in trying to improve instructional practice. Few innovations have proven as complex as interdisciplinary instruction. Despite the rich history of interdisciplinary teaching and the strong record of success (Beane, 1996), teaching that connects learning across disciplines remains the exception rather than the rule in contemporary classrooms.

In his classic text, Briggs (1920) listed "integrative education" as one of the five hallmarks of successful intermediate schools. While at first glance, the term "integrative" may seem a bit dated, I think that Briggs' term continues to describe the meaningful learning experiences we hope to create for students. Beane (1996) identified three essential characteristics of teaching that helps students make connections with academic content:

- focus on problems and issues of immediate concern rather than preparation for examinations,
- organization without regard for subject area lines, and
- encouragement for students to make their own personal connections (p. 6).

Throughout this paper, I refer to such teaching as "integrative."

In spite of the fact that educators have advocated integrative instruction for most of this century, such teaching remains relatively rare. Recent survey data suggests that in terms of organizational arrangements, we have made clear progress. In their comprehensive analysis of middle school practices, McEwin, Dickinson, and Jenkins (1996) found that 59% of the nation's sixth graders now have interdisciplinary teams of teachers, followed by 53% of seventh graders and 45% of eighth graders. In 1968, those frequencies were 8%, 6%, and 6%. More "middle schools" and more "interdisciplinary teams," however, do not necessarily mean more curriculum integration. A majority of respondents to the survey (60%) reported that they used interdisciplinary instruction less than 20% of the time; 24% of the schools indicated usage in the 21-40% range; and only 16% estimated usage of more than 40% of the time. These data suggest that while almost half of the middle school students in their study experienced some form of interdisciplinary organizational arrangement, relatively few experience "integrative" learning that crosses disciplines and creates personal connections. These data also suggest that teachers who attempt integrative instruction often feel that they are "teaching against the grain."

This concept paper reviews several case studies of teachers attempting to provide integrative instruction in the middle grades. My review of these studies focused on three questions:

1. How does integrative instruction reflect core values?
2. How do teachers attempting integrative instruction describe the challenges they face?
3. How might we encourage school cultures that nurture integrative instruction?

Connecting in Context: Conditions of Success

A review of some of the ways that teachers' perceptions shape their instructional practices provides a foundation for analyzing interdisciplinary teaching in context. A series of case studies conducted here at The University of North Carolina at Greensboro (UNCG) over the past decade have documented some of the ways that teachers' decisions are shaped by core values toward teaching and learning (Hartman & Strahan, 1997; Smith & Strahan, 1997; Strahan, 1990, 1993). By linking lesson observations, teachers' reported decisions, and guided reflections, these studies have illustrated ways that teachers' frames of reference are structured by deep-seated "orientations" toward teaching that are only partially revealed by what teachers say and do. How teachers view themselves, how they see their students, what they prize most about their subject matter - these orientations are the "core values" of teaching (Strahan, 1994, p. 240).

These core values are negotiated in the specific cultures of school settings. In practical terms, school culture may be defined as " who we are" and "how we do things around here" (Strahan, 1994, p. 7). The "way we do things around here" is the composite of individual and collective perspectives. In our analysis of four case studies written with teams of teachers attempting to integrate their instruction, Brenda Leake and I noted the contextual nature of curriculum development.

> Each of the authors emphasized the situated nature of teachers' decisions about what and how to teach... Insights generated in these studies are thus bound by the contexts of the schools themselves and by the voluntary nature of teachers participation. (Strahan & Leake, 1993, p. 89)

Each of the studies we reviewed highlighted a set of tensions surrounding teachers' core values. These tensions included differences of opinion over instructional priorities, day-to-day difficulties in finding time to plan together, and pressures toward subject-centered accountability (p. 90).

It would seem that for a team of teachers to collaborate in planning lessons that connect with students across disciplines, at least three conditions must occur:

1. Each member of the team must believe in the value of interdisciplinary learning.
2. The team must create time and space to work together.
3. The team must learn to plan collaboratively.

The Case of Team Genesis

While the barriers to interdisciplinary teaching seem straightforward, the types of contextual conditions that nurture and inhibit integrative teaching are less familiar. My experience with Team Genesis at Northeast Middle School over the past four years may offer a few clues. To address these issues, I reanalyzed the teams' experience as reported by L'Esperance (1997) and conducted interviews with members of the current Team Genesis. Figure 1 displays the interview protocol.

Figure 1. Interview Protocol for Team Genesis

1. Tell me about working together this past year.
2. What are your greatest successes?
3. To what do you attribute these successes.
4. What have been your greatest frustrations. Why?
5. Please share some examples of integrated instruction.
6. What is there about Northeast Middle School that has encouraged you to integrate the curriculum?
7. What would you advise a team in another school who wanted to try an integrated approach?

The story of Team Genesis began with Mark L'Esperance's study of curriculum development as part of his Master's degree program at UNCG. His detailed examination of Beane (1990) convinced him that curriculum integration was not only desirable but do-able. He recruited two colleagues who shared his beliefs and they began developing a proposal to put theory into practice.

Over the next three years, Team Genesis crafted a student-centered approach to instruction. At the beginning of each year, they surveyed their students to learn more about their needs and interests. They designed thematic units and assessments to connect student interests with key ideas from the standard course of study. The resulting units featured explorations of ideas such as identity, wellness, interdependency (which includes cultural diversity), and the environment (L'Esperance, 1997, p. 15). Team Genesis planned activities that addressed these themes and incorporated learning skills such as communication, computation, researching, reflective thinking, critical ethics, problem solving, valuing, self-esteem, and social action skills (p. 16). The wellness unit, for example, began with students' examination of the lifestyles of senior citizens, an analysis of healthy practices, and the development of their own profiles at age 55. As the unit progressed, students extended this analysis to include examination of the health and wellness of historical figures. Other activities included peer surveys, aerobic exercises, development of frequency distribution tables, graphing, library research, and project presentations (pp. 17-19).

As they planned and presented their units, Team Genesis teachers gathered data regarding students perceptions of themselves and schooling.

> The results of data collection, which included both formal and informal methods, indicate that the students improved academically (EOG and Goals tests). The majority of students felt better about their school (Quality of School Life Test, conversations and surveys), felt better about themselves academically (Student Progress profile Checklist, surveys, and conversations), and had the least amount of behavior referrals (administrative records). In addition, the parental survey indicated both the amount of support for and positive attitudes toward the program. (p. 32)

In reflecting on their experiences across these three years, the team attributed their success to support from their administration, the university and their community.

In 1996, Mark left Team Genesis to begin full-time doctoral study. At that time, the team decided to record their experiences of the first three years in L'Esperance (1997). In that monograph, the principal reported that

> Our thematic program at Northeast Middle has expanded into two total thematic teams, one 7th grade and one 6th. Several other teams incorporated many of the original concepts. This true middle school concept has contributed to a school-wide increase in academic achievement, and an increase in parental support and involvement, while significantly decreasing discipline problems. (p. 9).

Over the next year, team Genesis continued with two of the original three teachers providing leadership. This year, Team Genesis involved one team of three seventh grade teachers. This team includes one of the original teachers (now in her fifth year) and two team mates who started this year. In a group interview this past month, the team reported several different perceptions.

1. Even though the teachers have changed over the five years of the program, Team Genesis continues to be successful in encouraging learning and promoting achievement.

Teachers reported that they have continued the basic integrative approach developed by the first Team Genesis. They offer four thematic units each year. All three teachers contribute to these units in ways that blur the disciplinary lines. For the past two years the four themes have been "identity," "wellness," "interdependence (culture)," and "the environment." These units have provided a core of activities that the new members of the team have been able to enrich and extend. Teachers report that their primary lens for assessing progress is individual performance. "Hearing that ___ is having her best year yet is the best evidence we have that what we are doing is working." Survey data continue to show high levels of student and parent satisfaction. Discipline referrals continue to be the lowest in the school. Scores on achievement tests continue to surpass the rest of the school. The culminating field trip to the beach was a great success.

2. Even so, few other teachers have embraced the Team Genesis approach and plans for next year are uncertain.

Teachers reported feeling negative peer pressure from their colleagues. With one member of the team planning to take a maternity leave next year, the two remaining teachers have had difficulty finding another faculty member willing to step in to the team. They are planning to progress with their students to eighth grade and are not sure how the other eighth grade teachers will receive them. Their students report hearing negative comments regarding the "privileges" given Team Genesis (field trips, teamwide support during intramurals, extra help form parents and community partners). One teacher expressed this attitude as "our students feel they always need to prove something - that what we do is for real."

3. The keys to continuation seem to be team camaraderie and administrative support.

Teachers report that while they did not know each other well at the beginning of the year, they have become very close friends who socialize outside of school. They describe their way as "one for all and all for one" in regard to decisions and day-to-day procedures. "We have to watch out for each other." They perceive their principal as very supportive. They described how he had encouraged them to present their ideas to the rest of the faculty, offered them public praise and backed all of their ideas. Their impression is that other teachers have resented this and they now perceive their relationships as "us against the rest of them." When their principal recently announced that he was leaving, they became even more concerned about whether or not they will be able to continue. While they are not sure what will happen at their middle school, they remain very committed to the integrative approach they have developed and are anxious to help teachers at other schools who might wish to try something similar.

Conclusions

The experience of Team Genesis teachers illustrates some of the ways that integrative instruction requires teaching against the grain. From the beginning, all of the teachers who have participated have negotiated three connected sets of tensions. *Philosophically*, they have identified themselves as sharing deep-seated beliefs in integrative learning. Even though they felt that other teachers questioned these beliefs, they made a commitment to Team Genesis as a way of putting this theory into practice. The resistance from their colleagues that they have encountered may have encouraged them to respond with a protective stance toward their students and team mates. *Practically*, they have had to find time for the extended conversation they needed to create plans. Working through these logistical barriers, they have developed strategies for addressing subject-centered pressures for accountability. By charting progress on multiple measures of achievement, they have enhanced the practicality of their efforts. *Politically*, their biggest challenge has been to find ways to promote a supportive school culture. Support from their administrators and key colleagues has given them the political space they have needed to sustain their work.

Two elements seem essential to their continued success and to the success of other integrative efforts. First, teachers need a supportive principal who provides guidance and protection. Second, they need "kindred spirits" as team mates who can sustain them personally and professionally. Team Genesis hopes to continue its mission as an eighth grade team next year. As their story continues, we will learn more about the contextual conditions that nurture and inhibit integrative teaching.

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Teaching and Learning Mathematics

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Early in the twentieth century, John Dewey asserted that learning comes from experience and active involvement by the learner. Much has been discovered since then about how children learn mathematics, but the importance of meaningful experience remains unchallenged (Reys, Suydam, Lindquist, & Smith, 1998).

All students come to the classroom with some mathematical knowledge. Instead of simply accepting new information, students interpret what they see, hear, or do in relation to what they already know. Mathematics learning is influenced by the factors specific to the individual, such as previous experience, environmental influences, maturation, ability, and motivation. Mathematics learning is a slow process that requires years of development. Knowing that many individual differences exist and that the rate of learning varies greatly among children, the essential role of the teacher is to help children construct mathematical knowledge that is meaningful to them (Reys et al., 1998).

The National Council of Supervisors of Mathematics (NCSM) proposed components of essential mathematics in 1989. Along with computational skills, NCSM also included problem solving, communicating mathematical ideas, mathematical reasoning, and applying mathematics to everyday situations.

NCSM stated that appropriate computational skills should allow students to gain facility in using addition, subtraction, multiplication, and division with whole numbers and decimals. Long, complicated computations should be done with a calculator or computer. Knowledge of single-digit number facts is essential, and using mental arithmetic is a valuable skill. In learning to apply computation, students should have practice in choosing the appropriate computational method.

Learning to solve problems is the principal reason for studying mathematics. Problem solving is the process of applying previously acquired knowledge to new and unfamiliar situations. Students should see alternate solutions to problems, and they should experience problems with more than a single solution.

Students should learn the language and notation of mathematics. They should learn to receive mathematical ideas through listening, reading, and visualizing. They should be able to present mathematical ideas by speaking, writing, drawing pictures and graphs, and demonstrating with concrete models. They should be able to discuss mathematics and ask questions about mathematics.

Students should learn to make independent investigations of mathematical ideas. They should be able to identify and extend patterns and use experiences and observations to make tentative conclusions. They should learn to use a counterexample to disprove a conclusion, and they should learn to use models, known facts, and logical arguments to validate a conclusion. They should be able to distinguish between valid and invalid arguments.

Lastly, students should be encouraged to take everyday situations, translate them into mathematical representations, process the mathematics, and interpret the results. Students should see how mathematics is applied in the real world, and they should observe how mathematics grows from the world around them (NCSM, 1989).

The importance of skills versus concepts in mathematics learning has long been debated. Skills (procedural knowledge) and concepts (conceptual knowledge) are both necessary for expertise in mathematics. Teachers need to understand what constitutes procedural and conceptual knowledge and the importance of helping students make connections and establish meaningful relationships between them (Reys et al., 1998). Procedural knowledge is based on a sequence of actions, often involving rules and algorithms; conceptual knowledge, on the other hand, is based on connected networks that link relationships and discrete pieces of information (Hiebert & Lefevre 1986). Procedural knowledge can be acquired in a more passive mode, as when a certain procedure is demonstrated or illustrated and the student is required only to imitate the technique. Later, the consequence of such rote learning is observed as the student grasps for a set of steps, a rule, or a formula to apply in some algorithmic manner. Conceptual knowledge requires the learner to be active in thinking about relationships and making connections, along with making adjustments to accommodate the new learning with previous mental structures (Reys et al., 1998).

Practical principles for teaching mathematics (Reys et al., 1998) address specific issues in thinking about how children learn mathematics. The first principle, actively involve students, is based on the conviction that active involvement will encourage students to make sense out of what they are doing and thereby develop greater understanding of mathematics. Second, learning is developmental, states that children learn best when mathematical topics are appropriate for their developmental level and presented in an enjoyable and interesting way that challenges their intellectual development. Third, build on previous learning, states that mathematics must be organized so that it is appropriate and understandable to students. Because mathematics includes both procedural and conceptual knowledge, the challenge is not only to develop these types of knowledge, but also to establish relational understanding between them. Fourth, communication is integral, states that students should have many opportunities to use language to communicate their ideas. Fifth, good questions facilitate learning, states that questions are a vital element of the learning process. Students can and should ask questions of each other and of teachers. Teachers need to know when to ask a question and what kinds of questions to ask. Lastly, manipulatives aid learning, states that manipulatives should help children link, connect, or establish meaningful bridges from the model to the mathematical concepts.

Assessment of mathematical learning may be thought of as the process of gathering evidence about students' knowledge of, ability to use, and disposition toward mathematics, and of making inferences from that evidence for a variety of purposes (NCTM, 1995). Assessment standards were established by NCTM to promote the criteria that teachers and others can use to develop assessment practices that will aid all students in developing mathematical power (Reys et al., 1998). According to Reys and his colleagues, there are several different techniques to use when assessing students. Observations give information about groups of students or individuals and when planned can help decide what to do while presenting a new concept. Assessing through questioning actively involves students and helps to know more about what they are thinking. Questions can help gauge whether students understand the mathematics, whether they are approaching a problem in different ways, whether they can generalize, or whether they can explain their thinking. Interviewing is a combination of questioning and observing. It is a powerful way to learn about a student's thinking and to give the student some special attention. Some skills can only be assessed through performance tasks. Performance tasks often mirror the real world, are open-ended, and require time for grappling with a problem. Self-assessments allow students to evaluate their own work and take responsibility for their learning. Students can also analyze each others' strategies and then begin to see different ways to proceed and make judgments about which way makes the most sense to them. Work samples include written assignments, projects and other student products that can be collected and evaluated. Portfolios can be a rich source of information for the students. Students are able to reflect on different mathematical tasks and are able to track growth of their developmental thinking. Writings allow students to express what they do and do not understand for an assignment, how they feel about an activity, what they learned in class, or what they like about mathematics. Lastly, written tests should be used to guide instruction and not just the determinant of a grade. Alone, they will not give a complete assessment of students' knowledge, but they can add one more piece to the puzzle.

Students internalize content in mathematics by organizing groups of similar thoughts or actions. Children's knowledge is not limited to a collection of isolated pieces of information. Children use the information they accumulate to construct an overall view of how the world operates. They construct their own body of knowledge from their experiences. Piaget proposed that the things that children learn and can do are organized as schemes. Although children's schemes change over time, the processes by which they develop remain the same. Assimilation is a process of dealing with an object or event in a way that is consistent with an existing scheme. Accommodation is a process modifying an existing scheme to account for the new object or event or the process of forming an entirely new scheme to deal with the new object or event. Assimilation and accommodation typically work hand in hand as children develop their knowledge and understanding of the world. Children interpret each new event within the context of their existing knowledge (assimilation) but at the same time may modify their knowledge as a result of a new event (accommodation) (Ormrod, 1998).

Mathematics is a discipline that involves patterns and generalizations. Other disciplines also have patterns and this similarity allows students to easily make connections between the disciplines. Educators need to have an understanding of the content in their discipline and also in other disciplines. They need to teach the discipline for understanding and assist the students in constructing personal meaning. Once students develop this knowledge and are given the appropriate experiences, they will make the connections between what they are learning in mathematics and what they are learning in other disciplines.

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Reading Instruction for Children in Elementary Schools

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An area of research that has intrigued many educators is the study of reading instruction and its effective implementation in the elementary schools. Currently, teachers are using various approaches and are operating under several different theories of instruction. Adherents to conflicting theories all claim to have found the one best way to teach children how to read. The roots of many modern theories and conjoining terminology can be traced to theories that were previously implemented in the elementary schools. New terminology and new findings in reading instruction are often superficial indicators of change (Early, 1992; Otto, 1994). Strategies which are heralded as new and improved may, in fact, be rejuvenated versions of instructional practices that were used previously. This preliminary review of the literature examines the current instructional approaches and addresses the question of whether there is one best way to teach a child how to read.

Characteristics of Instructional Strategies

This literature review has found several instructional strategies that are current practice among elementary school teachers. Complementary and conflicting views of how a child best learns to read are represented in the literature. A few articles mentioned basal instruction but did not advocate it as a form of instruction (McGee & Tompkins, 1995; Thelen, 1995). Basal instruction is a direct instructional approach which is dictated by scope and sequence charts. The companies that produce the basals decide what the children should read and how they should respond to what has been read. The stories presented in traditional basals usually have been simplified and have, therefore, lost the richness of meaning that is present in authentic literature. Learning to read is viewed as the mastery of sets of sequential skills, and this is accomplished by using reading materials that have simplified syntax and controlled vocabulary (Sloan, 1991). When using a basal, there is a tendency for teachers to use round robin reading. This approach has been used for more than 200 years. It is competitive and unfair to less capable readers, and it limits active participation (Kelly, 1995). Under the basal approach, the teacher and the students have few choices to make. Activities consist of worksheets and assessment is conducted in end-of-unit tests that are in standardized form (Thelen, 1995). The basal approach promotes a centralized structure where the teacher is the omniscient authority who possesses all the right answers, and the students' participation is restricted to responding.

If this approach does not adequately reach the goals that a teacher has set for her classroom, then another approach that may be more appealing is the literature-based approach. This is a decentralized approach where the students play an active role in what is being discussed and ultimately learned. Students participate in book clubs, literature circles, conversational discussion groups, and grand conversations (Wiencek & O'Flahavan, 1994). Additionally, when using picture books, teachers should encourage readers to notice the relationship between the words and the pictures. Illustrators provide pictures that will relate to the story in one of the following ways: explain the meaning, extend or expand the meaning, or add meaning to the story (Stewig, 1992). When children are aware that the pictures can provide them with an explanation or further insight into what the author is saying, it helps them to understand the text. Literature-based instruction includes direct instruction as needed, and response to literature may include the use of worksheets. The teacher decides what children will read, and narrow themes are often built around what is read.

This literature-based approach moves closer to the whole language approach, and actually shares some features with it. Both approaches immerse students in reading and writing activities and do not rely on a Teacher's Script. In the whole language classroom, listening, talking, reading, and writing all provide the student with knowledge about language and should be integrated into the curriculum (Brown & Cambourne, 1987). This knowledge of language can be augmented through mini-lessons, which provide explicit instruction in reading and writing. The literacy act or the artifact that is being demonstrated in the mini-lesson should be presented as a whole so the students have enough information about the various systems and sub-systems of language (Cambourne, 1988). When language is presented in whole, meaningful contexts, it is easier for students to learn about written language conventions (Rhodes & Dudley-Marling, 1988). Active and continual engagement in reading and writing is an important part of the whole language approach. Teachers learn about and respond to students' reading and writing needs through individual conferences (Rhodes & Dudley-Marling, 1988). These conferences are well organized and records are kept on each student. In the whole language approach, broad themes are built around the total curriculum, and students have a choice in literature and activities. The activities are authentic, and the evaluation, which is continuous, is also authentic (Thelen, 1995).

A whole language approach can be successful, because it provides the students with an opportunity to enjoy real literature, and it helps them to formulate a better understanding of the material and the author's intentions. Students are able to produce and consume knowledge, they develop improved thinking and problem-solving skills, and they also gain a positive attitude about school (Harris & Graham, 1996). These qualities also are present in a classroom where the constructivist approach is used.

Harris and Graham (1996) advocate a classroom where a philosophy of constructivism is used in an integrated approach. They contend that integrated instruction should include not only ongoing assessment of the students' knowledge, abilities, motivation, and prior experiences but also explicit, focused, and isolated instruction as needed to teach skills, processes, strategies, and understandings. However, they caution against returning to an approach where skills instruction is an end in itself. The skills instruction should be done as needed and integrated into an authentic, literary context.

Students' use of context for more efficient reading is also discussed in the literature. Students are believed to be active hypothesis-makers and by connecting letters and phonemes, they can recognize unfamiliar words when they rely on the context of what is being read. This strategy is used prior to well developed decoding skills. As knowledge of orthographic patterns increases, reliance on context decreases. If students do not increase their decoding skills, they will continue to rely on context and will be poor readers (Goyen & McClelland, 1994; Juel, 1995). Traditional phonics approaches do not help the students to perceive words as phoneme sequences, but orthographic analogies can be used successfully. Students use orthographic analogies when they consider the spelling pattern of one word in order to figure out the spelling of other words (Goswami, 1995).

Initial instruction is based on onsets and rimes, instead of phonemes. Phonemes correspond to single letters or digraphs, and full phonemic awareness does not usually occur until a child has been reading for about a year. An onset is the spoken sound that corresponds to any consonants at the beginning of each syllable. The rime is the sound of the rest of the syllable. At four and five years of age, most children are aware of onsets and rimes (Goswami, 1995). Specific instruction of onsets and rimes will help students to see the relationships among words and will help them to be better spellers and readers. Graphophonemic instruction should begin with onsets, then rimes, and then the onset and rime can be split in order to examine the phonemes. Knowledge of 37 rimes will enable students to read 500 of the most frequently used words in primary texts (Goswami, 1995).

Teacher-mediated learning is an approach that is based on the assumption that students have a zone for learning potential called the zone of proximal development (Stewart, 1995). It is imperative that students interact with adults and knowledgeable peers in order to reach their learning potential. To ensure scaffolding in reading instruction, it is important that the teacher activate students' prior knowledge about a topic before she reads aloud to the group. The students then follow along in their own copies of the book while the story is read again. This process can be followed by group readings and discussions about the story. Emergent literacy development should include storybook reading, which is coupled with discussion and careful attention to the print and illustrations. Another aspect of the teacher-mediated approach is the Experience-Text-Relationship method (Au, 1979). The teacher first must determine the students' level of understanding. The students then read silently and are eventually encouraged to make connections between their background knowledge and the information in the text.

According to Zarrillo (1991), teachers should also encourage students to take an aesthetic approach to reading. The students' focus of attention and purpose is guided by whether they perceive reading to be an efferent or aesthetic process. When encouraging an aesthetic stance, literature should be appreciated for its artistic value and not used to directly teach reading skills. Students should be provided with ample time to read silently in a risk-free environment where they feel free to express their emotions and thoughts. An aesthetic response to literature is also encouraged in Transactional Strategies Instruction (TSI) (Brown, Beard el-Dinary, Pressley, & Coy-Ogan, 1995). In TSI, the teacher explains and models strategies that the students should use when they are reading. The students should be able to predict, restate ideas in their own words, relate information to their background knowledge, and monitor whether or not the text makes sense. When they encounter unfamiliar words, they should read on, reread, guess by using context clues, or look back. Responsibility for appropriate strategy application lies with the students, and they are encouraged to explain why they have chosen certain strategies in certain situations.

Concern for students and the appropriate conditions for reading instruction are addressed by Cambourne (1995). The teacher should approach reading instruction in such a way that it is natural for the students. Research on how a child learns to talk can be applied to how a child should learn to read. The conditions that are present when a child learns to talk are immersion, demonstration, engagement, expectations, responsibility, approximations, employment, and response. When these conditions are applied to reading instruction, the students are able to read successfully in a natural way.

Similarities of Instructional Strategies

The aforementioned approaches to reading instruction have several similarities that should be highlighted. Certain teacher behaviors are found to be common factors of several approaches. Teachers are encouraged to facilitate the learning process by providing the students with explicit strategies they can use when reading. Students should be encouraged to predict, confirm, paraphrase, monitor, and summarize what has been read. The teacher should demonstrate how to use these strategies and guide the students until they are able to use them independently. The students should then explain how they choose a strategy and why this strategy is effective (Brown et al., 1995; Juel, 1995; McGee & Tompkins, 1995). The teacher functions as a model for the students, so they will eventually internalize the strategies and be able to read independently. The teacher also helps the students to reach their potential by scaffolding (Juel, 1995; Stewart, 1995). Another common teacher behavior that is mentioned in the literature is direct instruction. Direct instruction has been found to have a high, positive correlation with increased scores in the area of comprehension (Bartley, 1993).

These teacher behaviors can be augmented when writing is incorporated into the reading instruction and predictable print is used. Big books, trade books, and books with predictable storylines enhance literacy development. Students should be provided with individual copies of the books, and they should be involved in meaningful activities centered on the content (Juel, 1995; Stewart, 1995). Teachers should integrate reading and writing, because the two activities use many of the same thought processes. Writing should be used prior to, during, and after reading (Bartley, 1993). Writing can help the students better understand the graphophonemic structures and will strengthen reading achievement if emphasis is placed on the writing process (Juel, 1995; Stewart 1995). When the students keep journals in which they write personal responses to literature, these responses can be used as resources when they participate in group discussions (Wiencek & O'Flahavan, 1994).

Several approaches advocate aesthetic response during group discussion and silent reading. This response encourages the students to create personal versions of the text. The literature is not seen as having an objectified truth; truth is constructed by the readers' experiences (Brown et al., 1995; McGee & Tompkins, 1995). Reading is believed to be a transaction between the reader and the text. The teacher can encourage an aesthetic response by how she poses questions and prompts. The questions should be open-ended, and students should be encouraged to relive the reading experience and make interpretations through personal association and speculation (Zarrillo, 1991).

The final similarities concern phonics instruction and assessment. Researchers agree that traditional phonics instruction is not beneficial. The texts are contrived, and the skill and drill worksheets often have nothing to do with the corresponding story. Traditional phonics does not help students to perceive words as phoneme sequences (Juel, 1995). Phonics teaches a digraph in all positions of the word, but some letter-sound correspondences are more difficult to distinguish when placed in the middle of a word. When students are learning to read, it is easier, and more natural, for them to focus on onsets and rimes (Goswami, 1995). Assessment of what the students have learned should be continuous, and should consider the students' abilities, skills, knowledge, motivation, social characteristics, and prior experiences. Support can then be planned depending on the students' needs (Cambourne, 1995; Harris & Graham, 1996).

Inconsistencies Among Instructional Strategies

This review has also revealed some differences in views about the whole language approach. Harris and Graham (1996) state that teachers who implement the whole language approach do not give students much isolated or explicit instruction, and they do not instruct students in phonics, handwriting, or spelling. The whole language approach provides isolated and explicit instruction through individual conferences. Students are instructed in the graphophonic cue system, but this is done in conjunction with the syntactic, semantic, and pragmatic cue systems. In other words, phonics instruction is conducted in light of the whole literary artifact; phonics is not viewed as an end in itself. Spelling instruction is also conducted as a meaningful whole. When words are presented in isolation, it is a more difficult word recognition task than if words are explored in context (Smith, 1985). Handwriting practice occurs because the students are constantly engaged in meaningful writing activities across the curriculum. Handwriting is not separated out as a separate academic subject.

Adherents to the whole language approach believe that with increased knowledge of the topic, readers are able to make better use of context and rely less on the visual information that is present in the text. Juel (1995) states that poor readers rely more on context than good readers, and that eye-movement studies and computer simulations suggest that skilled readers look at almost every word and letter in the text. Juel (1995) also takes issue with the belief that learning to read can be equated with learning to talk. She states that oral language is biologically driven and written language is not. Learning to read is, therefore, a more difficult and a more unnatural process, and students should be provided with more knowledge about the mechanics of reading. The students are likely to fixate on incorrect hypotheses and must have explicit guidance in order to learn how to read. Cambourne (1995) states that learning to read should be equated with learning to talk, and teachers should not adhere to a belief that inappropriate responses must be eradicated before they become fixed in the students' repertoire.

Role of Underlying Theory

A teacher's beliefs about reading instruction and how inappropriate responses should be handled are guided by the theory of learning to which she adheres. It is important to examine the theory that is being championed, and then look at what is going on in the classroom to determine if there is a fit between theory and practice. Reading instruction is influenced by a teacher's goals and definition of reading (Carbo, 1995). In literature-based instruction, theoretical perspectives will determine how a teacher presents a text. If reading is believed to be an interactive, strategic process, then use of schema and strategies will be encouraged. If reading is believed to be the study of literary forms, then a structuralist perspective which highlights how all literature is unified will be encouraged. If personal response to literature is emphasized, then readers will be encouraged to respond from an aesthetic stance. Finally, if reading is seen as critical literacy, readers will be encouraged to recognize stereotypes and use their knowledge of the culture to interpret the literature (McGee & Tompkins, 1995).

The most prevalent theory mentioned in the literature was Vygotsky's zone of proximal development. Intersocial activities will eventually become intrasocial and will belong to the student (Brown et al., 1995; Stewart, 1995; Wiencek & O'Flahavan, 1994). It is important that scaffolding, collaboration, and demonstration be a part of classroom practice. The constructivist theory was also advocated in the literature. In this theory children are inherently active and self-regulating, and they construct knowledge in developmentally appropriate ways (Harris & Graham, 1996). It is important that teachers implement classroom practice that corresponds to their theoretical perspectives.

Discussion

It may be true that educational research rarely finds new truths, but this research is needed to inform teachers as to what approaches, and combinations thereof, would be effective for their classrooms. This preliminary review of the literature found that there were many similarities among instructional approaches. Table 1 includes instructional characteristics for the varying approaches. The patterns suggest that the whole language approach encompasses more of the advocated instructional characteristics than any other approach. The only characteristics mentioned in this review that are not a part of the formal definition of whole language instruction are worksheets, teacher's choice of literature, and direct instruction. Teachers should evaluate the purpose of worksheets and determine if their use supports and facilitates the reading instructional goals. Teachers should also consider the theory to which they adhere and decide wherein falls the importance of choice. Is it important to allow the students to choose where they should focus their attention? Direct instruction, as needed, should be incorporated into the whole language approach through mini-lessons and individual conferences.

Table 1. Reading Instructional Techniques Advocated in the Literature

	LB	WL	CN	TM	TN
Decentralized	X	X	X	X	X
Students active	X	X	X	X	X
Discussion groups	X	X	X	X	X
Direct instruction	X		X		
Worksheets	X				
Themes	X	X			
Authentic literature	X	X	X	X	X
Integrate writing	X	X			
Teacher's choice of literature	X		X	X	X
Students' choice of literature		X			
Mini-lessons		X			
Individual conferences		X			
Authentic activities		X			
Authentic assessment		X			
Provide strategies		X	X		X
No traditional phonics	X	X	X	X	X
Activate prior knowledge		X		X	X
Silent reading		X		X	
Aesthetic response		X		X	X

NOTE: Literature-based (LB) Whole language (WL)
Constructivist (CN) Teacher-mediated (TM)
Transactional (TN)

This review suggests that regardless of the label given certain instructional approaches, the positive characteristics mentioned across the board are similar, and most of these are covered by the whole language approach. This is a valid instructional approach, but problems with its implementation and negative perceptions have arisen when teachers continue to use the basal approach methodology under the guise of whole language (Sloan, 1991). The effective characteristics of reading instructional strategies which are mentioned in this review can be presented without labels during teacher training.

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